PERSONAL
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MAY 19th · 1984 · No 61
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BBC GT?
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A dispute within VNU disrupted production of Personal Computer News so that we missed an issue last week. We apologise for this and assure subscribers that they will still receive their full year's worth of *PCN*s.

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Power to the BBC!
Five Torch Cell second processor packs together worth £1,700 to be won.
Just enter this simple competition, and you could win a prize to boost the power of your BBC. Each Z80 second processor comes with 64K of RAM, business software, full documentation and Z80 BBC Basic user's guide.

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H-P afoot

Hewlett-Packard's HP 110 — mobility allowance in a 6½lb package.

Hewlett-Packard has followed its touch-screen 150 with a 6½lb portable that looks a worthy candidate in the computing on the hoof stakes.

The HP110, launched in the US last week and expected to arrive in the UK on general release in September, has an 8086, runs MSDOS, and carries 272K of RAM. It measures 10in by 13in by 3in, has a flip-up 16 line screen of 80 characters each, and includes applications software in ROM.

In the US it will cost $2,995 but Hewlett-Packard expects it to check in at about £2,000 here. It won't be presented as an IBM-compatible, although it is designed to connect to H-P and IBM machines as an intelligent terminal or node.

'This is not an IBM clone,' said H-P's Clifford Mills. 'All our machines are built to our own standards and specifications.' He added that it was also an H-P designed and built machine rather than an OEM product.

The software included in ROM is Lotus 1-2-3, Memomaker, the Personal Applications Manager and data communications software. This leaves the main user memory area uncluttered and the 272K can be partitioned to use a section of it as a silicon disk.

Further software is available on 3½in disks, the company says. Like the 110 itself the HP9114A disk drives, with double-sided floppies, are battery-powered. Whether users will start to carry disk drives around with them remains to be seen but the devices add another string to the machine's bow.

Apples drop in Spring shakedown

In what could become an annual Spring festival micro prices are again beginning to fall.

Apple announced cuts to the IIe two weeks ago on the introduction of the IIc. Now it has issued a full revised price list, and its move has been imitated by Hitachi.

The Apple IIe has plummeted from £951.75 to £684.50 while the Apple III has made a similar drop from £2,754 to £2,287. The Apple IIe with disk drive and controller has gone from £1,475 to £914.50, while the Macintosh with Macpaint/Macwrite has been settled at £2,064. The new Apple IIc is £1,063, but the price of Lisa remains unchanged.

Mike Spring, marketing services manager, said he felt the IIc was very cheap and that prices on other micros should be cut in line with this. He added that Apple wanted to keep the IIe in people's minds, so the price cut of £287.50 was an added incentive.

To the suggestion of a price cutting war, he said: 'You'll see aggressive pricing from everyone and dealers won't discount because they won't need to.'

Of Hitachi's price cut on its PC from £2,595 to £1,995, a spokesman Ron Knox said: 'Hitachi willpass on any cost savings to consumers and dealers, and if there is a price war, Hitachi will cope with it.'

Despite the large slash of £690, Mr Knox denied that sales of the PC were in trouble and emphasised Hitachi's wish to be competitive.

But it is not thought that Hitachi's repricing will be the prelude to the introduction of new models — the next Hitachi computer to hit the UK should be an MSX machine.

WH Smith makes advance into business micro arena

Next time you're down at WH Smith collecting your copy of *PCN* you could also be buying an IBM-compatible. Smith has signed up the exclusive UK rights to the Advance 86, the UK-produced IBM look-alike that sells for £399.

This is for the Advance 86a, which has 128K as standard and uses tape storage, but the basic model can be upgraded to an 86b for a further £1,100, which includes two 360K disk drives, word processing, spreadsheet, database and spelling checker software and four expansion slots.

Smith, which last year sold £28m worth of computers, will initially be taking £2m worth of Advances, and though the high street chain previously stocked the Apple IIe, the Advance may turn out to be more of a serious try for the business market. The IIe will now no longer be stocked.

When it hits the high streets the Advance is bound to attract a certain amount of interest. At one level it's pitched directly against the £399 BBC Model B, while the full business version undercuts the IBM PC and its clones by a considerable margin.

Advance — WH Smith sounds the charge into business computing.

Epson RX80 competition — the winners

It seems a long time ago that the *PCN* Epson competition almost caused an industrial dispute among the overburdened postmen of London's West End. These noble bearers of Her Majesty's mail staggered daily to *PCN*'s office with the latest flood of entries — that's not to say that Her Majesty entered, of course.

But now it can be told! The waiting's almost over; the draw has been made and five Epson RX80s will soon be on their way to the winners.

So without further ado, congratulations to: JM Wild of Southampton; Duncan Williams of Abingdon; GJ McCloy of Sunbury; Gordon Cameron of East Kilbride; and Graham Reedier of Hull.

Commiserations to everybody else who entered.

Micro business books

A growing branch of publishing links books and games but now a new name has entered the list with a new battle-cry: You've read the book, now r an your business.

McGraw-Hill's Small Business Software series was launched last week with the participation of chartered accountant Spicer and Pegler, which wrote the software. The series is a number of software modules accompanied not by manuals but by books.

The six £28.75 packages run on the Apple IIc, Apple IIe or Apple II.

Essentially, the books are a cross between user manuals and financial teaching aids, providing explanations on different financial aspects of business. They are geared towards management and accounting students as well as business executives.

Enabling you to do anything from profit and loss accounts to spreadsheets, the six titles include Getting Your Finances in Order (featuring such star performers as balance sheets) and Evaluating Your Capital Expenditure, which calculates the expected return from various projects.

Marketing director John Beale says the series is also suitable for people inexperienced with micros.

Anyone with problems can consult the Help card inside each pack or call McGraw-Hill's software support service.

Along similar lines Dorling Kindersley has introduced the Goldstar range for home micros. This covers three separate areas — education, games and home/leisure.

Marketing manager Michael Pearce described the reading material as an 'illustrated leaflet/mini-manual' which comes with the software for £9.95.

While the games are for the Spectrum and BBC and the educational programs for the BBC and Electron, the home programs run on the Dragon 32 and will be implemented on the Commodore 64 and BBC in July.

Acorn buys Torch

In the week in which it finally released the Z80 second processor for the BBC, Acorn bought out the company that had turned the micro into a business machine more than a year ago.

Acorn celebrated May Day this year by buying out Torch Computers in a clear bid to catapault itself into the business micro arena.

'We are aiming to sew the deal up by the end of June,' said Acorn's non-executive director Dr Alex Reid. One result of the takeover, he said, was that: 'we hope this will advance Acorn's plans to build a business computer'.

The acquisition of Torch gives Acorn a ready-made line of communicating business systems, from the CP/M-like C Series to the 725 with Unix. It may be that Acorn found the development of a business micro more like climbing a greasy pole than dancing round a Maypole and that it opted to give itself a head start.

The deal has been three months in the making but Acorn's relationship with Torch goes back to the founding of the latter, when Acorn held a 33 per cent stake. It subsequently sold this share and Torch went its own way, flirting briefly with GEC last year (Issue 20) before coquettishly returning to Acorn's side this month.

Torch's chairman Bob Gilkes promised that there would be no reduction in the company's — now subsidiary's — product range, and in fact it added to it in several ways even as the ink was drying on the agreement. The new products include a communications package for the BBC micro, a mass storage device for the 301 Workstation and MSDOS on the business machines; it also disclosed plans for a hand-held Torch by 1986.

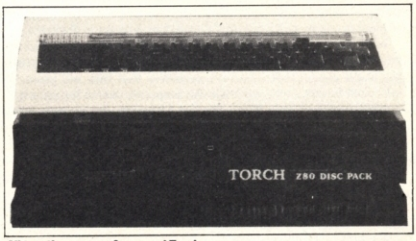
Torch also discussed its plans for 1985. These revolve around a unit provisionally called Torbus which it will place at the heart of multiprocessor systems. With as many as 16 base and applications processors, 4Mb of shared memory, and self-adapting Unix, Torch sees this computing engine running at 20 MIPS (millions of instructions per second).

Acorn, which earlier in the same week had taken a 25 per cent stake in a communications company called Torus, declared that it aimed to become a powerful and diversified group.

This shouldn't leave home micro owners out in the cold; Dr Reid said: 'There will be no neglect of the home micro market.' But when asked whether buying Torch would free Acorn to devote more resources to home micros he described the question as 'loaded'.

■ The beginning of May finally saw the release of Acorn's Z80 second processor for the BBC micro. A Z80B running at 6MHz carries with it 64K of RAM, leaving 55K available under CP/M 2.2. Acorn is bundling different types of software for different categories of user — office productivity aids, applications generators and programming languages.

The board plugs into the Tube port on the BBC. It costs £299 all in, and is available now from Vector Marketing — there may be a delay of two weeks before it appears at dealers.



All together now — Acorn and Torch.

Moving towards MSDOS

At the same time as the Torch and BBC products moved closer with the acquisition by Acorn, Torch announced moves in a different direction — putting MSDOS on the Beeb.

Torch is importing from the US a circuit board that adds an 8088 processor and 256K of RAM. The whole package will be sold as a single unit called the Torch 388.

The 388 will sell as an MSDOS workstation costing £1,995. To use as a standalone system you will have to add the cost of disk drives.

Meanwhile, Martin Vlieland Boddy, former chairman of Torch, has set up a new company called Data Technologies to design and market a box called the Graduate which holds out the promise of 98 per cent IBM compatibility. It comes in two options. The model G400 features a single disk drive and 128K of RAM and will cost £599. The G800 features a dual disk drive and will cost £869.

The Graduate can be expanded to 256K of RAM by plugging in extra memory chips and further expansion can be accommodated by use of two IBM compatible expansion slots.

In practice the two products are very different. The Graduate has been designed from the outset to be IBM-compatible. 'Yes, it will run Microsoft's Flight Simulator and Lotus 1-2-3,' says Mr Vlieland Boddy, 'It is at least 98 per cent compatible with the IBM PC and we have not come across any popular PC program that won't run.'

The Torch 388 makes no pretence of being IBM compatible. 'It is an MSDOS micro,' says Torch's research and development director Ray Anderson, 'It makes use of the disk controller on the BBC board which cannot read IBM disks.'

Mr Anderson also said that Torch currently has no plans to sell the 8088 board as an add-on for existing BBC users.

Intriguingly, the companies might end up working with one another. Mr Anderson confirmed that Torch has asked Data Technologies to quote for the design of an 8088 board for the BBC micro.

Kuma in quick

By Wendie Pearson

The first of 15 packages for the Epson PX-8 (Pro-Tested in this issue) is due out from Kuma next week, in the form of an editor-assembler.

This will be followed by other products such as Fig Forth and business applications. Although programs will at first be on microcassette Kuma is developing disk-based software as well, ready for the PX-8's disk drive which is due from Epson in late September.

Programs will cost between £50 and £100 said sales manager Jon Day, who also announced a price cut of over £100 to £454 on Kuma's disk drive for the Sharp MZ700.

QL on the move — but slowly

About 1,000 Sinclair QL micros are said to be in the process of being delivered to the lucky first in line on the QL waiting list.

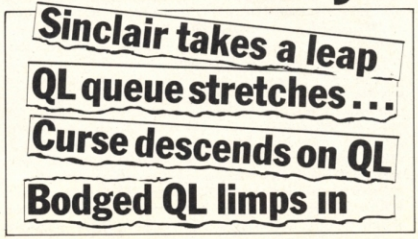
The company had trouble squeezing the operating system and Extended Basic onto the available ROMs. The current production model therefore has the balance of the code plugged into the expansion port on the back. Sinclair will offer free upgrades to early buyers when the modifications are complete.

The official word from Sinclair Research is that deliveries have started from the end of April as promised, but the company is not saying what the delivery figures are.

It confesses to a waiting list of 13,000 (unlucky for some). *PCN* can report that it has yet to get a sniff of the system either in the office or in the hands of individuals who placed their orders on the day of the QL's launch.

■ Sinclair has confirmed that a Winchester disk drive is in the offing for the elusive QL. No arrival date yet exists for the drive, which is still under development.

A RAMpack is expected to arrive simultaneously, according to a spokeswoman, to bring the QL's memory up from 128K to 640K.



QL: the story so far.

VIEW FROM AMERICA

Securing the future of videotex

By Chris Rowley

It's not as though Americans didn't have enough to worry about. But two recent entries on the National Fear Chart have really got people talking security wherever they come together in social groups.

First there was the unwelcome announcement that anything up to 35 serial murderers are abroad, or rather not abroad but right here at work among us, choosing their 'primarily female' victims at random. Then came horrible revelations of widespread sexual abuse of pre-schoolers at kindergartens with a dreadful case in Los Angeles to illustrate.

Americans are are already the most heavily armed people that the world has ever seen. They own more Doberman Pinchers than the rest of the world put together. Now it's predicted that they will press the microtext terminal into service in the desperate search for security.

We should note here that in the last 18 months ten or more police deparments from Washington to San Francisco have installed computerised fingerprinting systems; the Japanese giant NEC is currently building one in Alaska.

It isn't a new idea. The FBI has fiddled around with it for ten years now but the real progress has come from software firms designing systems for individual police departments. The breakthroughs are coming in optical storage devices, and both NEC and the FBI are working on laser disks holding 12,000 prints apiece for mass storage.

The new systems have proved very effective. San Francisco's print units are working on a database of 3 million and used to manage 20 to 25 print IDs a month. Now they can claim 100 or more.

In addition city to city check-ups are just a phone call away. Then there was the good news from the Videotex '84 Show in Chicago. New devices and software were offered to bridge once and for all the gap between the NALPLS (North American Level Protocol Syntax) Videotex code and ASCII microcomputerdom. The impossibility of using a micro as a videotex system terminal has been a crippling impediment to the growth of videotex in the US.

Of course, Network Nation has grown up anyway — there are now 400,000 subscribers to the big three ASCII micro network services: Dow Jones, Compuserve and The Source. These services are not cheap, costing typically $75 to join with monthly dues of $25 plus on-line fees (and don't forget the phone bill . . .). Videotex promises to be much cheaper, typically $10 a month as with Keyfax from Keycom, a joint venture involving Honeywell and Rupert Murdoch's News America Publishing.

At the show IBM unveiled PC/Videotex, which lets a PC for $250 or a PCjr for $220 decode NALPLS. AT&T was showing the $900 Sceptre, a dedicated videotex terminal, but the most exciting item was Toronto-based Arcor's $100 software cartridge that turns a $200 Commodore 64 into a videoex terminal.

Besides this there are videotex teleshopping services, like that of Comp-U-Card, which are beginning to make money. In the fourth quarter of 1983 Comp-U-Card made $880,000 on a turnover of $4 million — about double the previous year's figure. Comp-U-Card lists 60,000 products for shoppers seeking 25 per cent discounts by buying direct from the factory, and analysts predict a boom as soon as pictures can be included with details of the goods.

So the advent of PC-Eye, from Chorus Data Systems, must have been a pleasant surprise for teleshoppers. PC-Eye is a $500 plug-in board plus software that lets the IBM PC store video images from video cameras, recorders, or telecommunications. The short image acquisition time and the high-resolution offered by PC-Eye converts the PC into a low-cost full-scale image processor — just the thing for colour pictures of stereos and clothing, not to mention fingerprints.

Hence teleshopping's future seems bright, but it's the new area of telesecurity that may see the real boom. How long before the videotex security check — 'Just place your fingers on the touch pad' — becomes another aspect of having a nice safe day?

Peachware

Peachtree has taken integrated software a step further with Decision Manager, which combines applications with windows for users of the IBM PC and XT.

The package combines word processing, data management, spreadsheet, graphics and communications functions. It also makes extensive use of Peachtree's own windowing system and will be in competition with Open Access and Lotus's (unfinished) Symphony, its upgrade to 1-2-3.

To be available from July, Decision Manager will cost £625 and needs an IBM PC with 256K RAM at least. To get the most out of it you'll also need a colour monitor and a hard disk.

Data can be transported between the different functions and the communications aspect allows you to import data from IBM 3270 mainframes with your PC acting as a terminal. Up to 20 windows can be defined, with a maximum of ten active on-screen at any one time. Pop-up menus and help screens are used extensively to make Decision Manager easy to learn and use.

Also announced was MacAccounting, a cashbook program written for Apple's Macintosh by Peachtree programmers in Maidenhead. Making full use of the Mac's mouse, Peachtree claims users should be able to learn the system inside half an hour.

MacAccounting will be availble in June, the cashbook will cost £175 while the combined sales and purchase ledger is priced at £275. The two together will cost £375.

Decision Manager is the result of a collaborative programming effort from both sides of the Atlantic. It's interesting to see that British programming skills are now beginning to filter across to the US — the traffic has been very much one way to date.

CUB REPORT — And now, from the company which brought you the colour monitor for the BBC micro, come disk drives for the Dragon. Microvitec (0274-390011), basking in the glory of its recent Queen's Award for Technological Achievement, has launched single and dual disk drive units that work with both the Dragon 32 and the Dragon 64. Each disk has a capacity of 360K and runs the Delta disk operating system developed by Premier Microsystems.

Lomac launch

Lomac Computer Systems is adding to its range of business micros with the introduction of the L-XT, a £5,750 8088-based micro of which the main feature is Diplomat, a language-cum-database which enables you to program in English.

The system comes with 192K, an amber display, 360K single floppy disk drive, 10Mb Winchester, parallel port, two serial ports and three expansion slots. Options include an additional 20,40, or 60Mb of storage, additional 128K RAM, tape-streamer back-up unit and Power Fail. It runs MSDOS, and Lomac includes Word and Multiplan in the price.

By the autumn Diplomat will be available in RAM chip form for the IBM PC for £1,610, and will come with MSDOS plus 128K RAM. June will see a networking for the LX-T, letting you join up to 255 machines at one time.

Lomac sells both direct and through dealers and can be contacted on 061-941 6545.

Oric adds stock

Oric has responded to the shortage of software to run on the Atmos disk system by including a bundle of business programs and games in the disk starter pack. The catch is that the starter pack will now cost £30 more.

Oric uses a non-standard disk operating system in the Atmos and it cannot therefore rely on a readily available supply of software as would have been the case, for example, had it decided to use CP/M for its disk system.

So the company, through its Tansoft operation, has transferred several cassette programs on to 3in Hitachi format disks and included them in the disk starter pack.

On the business side there is Oric Base and Oric Calc. The games disk includes Tansoft Chess (featuring voice synthesis), Rat Splat, Star Ship Valiant and Frog Hop.

The price of the starter pack, comprising single disk drive, disk operating system, manual and the software is now £300.

■ Prism Microproducts is to become the primary distributor in the UK for all Oric's products.

Oric will continue to service directly the major high street multiples such as Dixon's, Lasky's, Curry's and Green's.

The deal should be good news for users as it should ensure healthier sales of the Atmos, encouraging a better flow of new software. Prism has also established a good reputation for after sales support to the dealers it supplies.

MEMORY EXTRA — Commodore UK has introduced a business machine with what it claims is the largest floppy disk capacity on a standalone system. The 8296D has an integrated 2Mb drive, which sets it apart from the 8296 also introduced last week. The 8032 and 8096 systems are superseded by these machines, which made their first appearance in Europe at the Hannover Fair last month. Several other Commodore products on show there are expected to arrive in the UK soon, notably the 264.

Key question

The latest attack on software piracy comes from Microdeal whose Dragon game Buzzard Bait comes complete with a software key.

Microdeal is currently pursuing three court cases on the piracy front and, with its software key, is hoping to halt the pirates in their tracks. The software key is only to be used on the Dragon at the moment but it will be produced for the Commodore 64, Atari and possibly the Spectrum, if the six-week trial marketing is successful.

The key plugs into the joystick port while the program is being loaded and if removed during this process causes the loading to stop and a message to be displayed to this effect.

Microdeal admits that the key is crackable, but believes this will not be too easy since it comes embedded in solid black plastic, discouraging electronic gadgeteers and giving hackers a field day.

The software key costs about £1.50 but during the trial marketing, it will be included at no additional cost.

Thorn trio on horizon

Thorn EMI Ferguson has released two new computer monitors and a dedicated computer cassette recorder.

The most expensive of the three is the Ferguson TX MC01, which at £229 includes an ordinary colour TV along with facilities for RGB and composite video inputs. The TV/monitor also incorporates what Ferguson calls automatic 'electronic signal routing' that causes the monitor to switch immediately to an ordinary TV station when you turn off your computer, thus eliminating the need to throw a switch at the back of the machine to move between RGB and ordinary TV input. The machine's colour output is provided by a 14in in-line CRT and allows presetting of eight TV channels in addition to the RGB input.

The MC01 can also be run in the field from a car battery or Ferguson's own special eight-hour battery pack.

Ferguson has also developed a monochrome dedicated 'green screen' monitor which it hopes to sell for under £80. It promises resolution good enough for 80-column spreadsheet and word-processing work and uses the P31 phosphor cathode ray tube.

The third new product is a dedicated cassette recorder that includes LED level monitors, sound monitor on-off switch, tape counter and wedge-shaped design that allows you easily to see how far your tape has advanced. Ferguson expects the recorder to cost about £29.

The colour TV-monitor should be available by the end of August, with the monochrome monitor and cassette recorder following in September.

Week in view

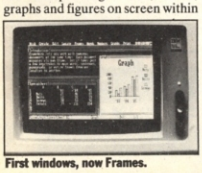
Picking up from where we left off, here's a brief round-up of some of the stories that would have appeared in last week's issue:

Stained glass windows

Ashton-Tate is following up on the success of dBase II and Friday! with another innovative software package.

Framework is an environment for manipulating words, ideas, graphs and figures on screen within 'frames' — which Ashton-Tate describes as more powerful and versatile than the 'windows' offered in other products.

Pull-down menus, in-context help screens and compatibility with dBase II are just some of the features. Currently, it will only run on an IBM PC and should be available in July.



First windows, now Frames.

Philips bears standard

Philips is getting together with leading French electronics group Thomson to launch a European standard micro to challenge the Japanese MSX micros.

Based on Thomson's new M05 home micro it will use the 6809E processor. The M05 will sell in France for around £200 and comes with 48K of RAM and the ability to run ROM cartridge software.

LSI's second-starter

LSI Computers has become the second British company in as many weeks to offer a super-micro based on the 80286 chip from Intel.

Unlike Rair, which is manufacturing its own machine, LSI is importing a machine called the Poppy manufactured by Durango Systems in California. It runs Xenix as its operating system with MSDOS and Concurrent CP/M supported as options.

The cost of a six workstation system with a 40Mb hard disk will be around £4,000 per workstation.

Husky reports new printer

Husky has introduced a 40-column dot-matrix printer to complement its Hunter handheld micro.

The Husky Reporter incorporates a mounting cradle to hold the Hunter, nickel-cadmium batteries to power the printer, and a recharging unit.

Towards 2000 with Tandy

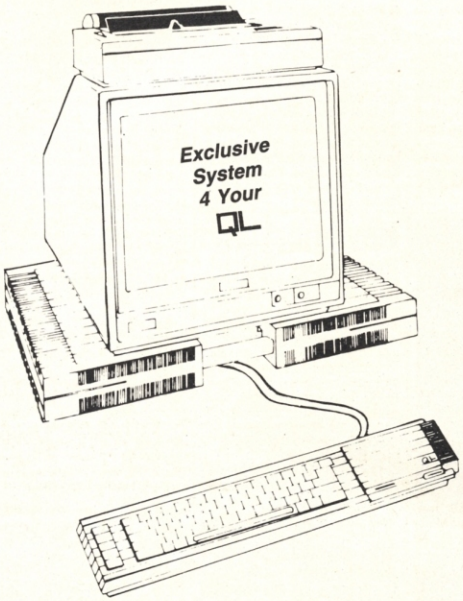
Tandy has launched in the UK the Model 2000 business micro (Issue 59). Using an 80186 processor it runs up to three times as fast as MSDOS machines using the 8088 processor as in the IBM PC. The 2000 features 128K RAM as standard expandable to 768K, and costs £2,000 plus VAT.

Husky Reporter — instant print.

Screenplay sets target

Screenplay, the Glasgow software house, is launching a nationwide competition to find the best program written using its Animator sprite generator for the BBC Micro and the Dragon. The prize will be £200 in cash, and royalties on the sales of the winning program.

4QL brother HR-5



4QL

The new Brother HR-5 printer in a black version — the 4QL Model is exclusive to Quantum Leap Systems (Sole UK Distributor)

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Cobol's future

Cobol reached its 25th birthday last week and its admirers promised that the next 25 will see it advancing through the realm of microcomputerdom. It is already possible to buy a Cobol compiler in the US for $39.

The Codasyl Cobol committee, which is responsible for the development of the language, celebrated the anniversary of its brainchild in London last week. At the same time in working meetings it discussed the future shape of the language, and several of the features under discussion have a direct bearing on popular micros where memory limitations are increasingly less important.

Through a separate sub-committee the Codasyl organisation is moving towards the definition of a standard implementation for Windows/Icons/Mice Programs (Wimps) and touch-screen technology as represented by the Hewlett-Packard 150.

Another sub-committee is working on the screen management elements of Cobol, a long-neglected aspect of the language.

Members of the committee said that Cobol had limitations, particularly in calculation-intensive applications like spreadsheets.

So why should you consider Cobol as your business programming language? Its features in output editing and file handling are 'unmatched', says the committee. It also offers a strong possibility of portability, particularly from micro to mainframe and vice versa; it represents some 60 to 70 per cent of stock of programmed code and hence has the greatest number of users/programmers; and finally, at 25 years old, it is relatively stable.

The late IBM show

While IBM outrages the international computer community by giving two to three years' notice of a networking product previously expected this year, third party manufacturers continue to step in with their own networks.

P&P Micro Distributors has announced the 10-Net, claimed to be a fully developed IBM PC Local Area Network system. Features include electronic mail, a user-to-user communication facility, and printer spooling (where the text can be up-loaded, freeing the computer for other duties).

P&P claims the systems can be implemented with full device sharing without affecting the current applications programs designed for the IBM PC and its clones. And it does it without having a dedicated PC acting as a file server.

The 10-Net is not the first networking system for the PC, and it won't be the last. IBM has recently announced the development schedule for its own PC LAN. The cabling will be available in October with a hazy promise of further releases in up to three years.

The people's computer misses UK

First there was the Volkswagen Beetle — the people's car — which rocked pre-war Germany with it's unlovely design and rear-end motor.

Now the German car giant has put its name to a micro — the Volksmicro — otherwise known in this country as the Triumph Adler Alphatronic home computer. The European version of this unexceptional CP/M machine has most of the attributes of the original Volks-machine in being a little on the ugly side, utilitarian and selling relatively cheaply and in Europe it will bear the Volkswagen name.

A Triumph Adler spokesman in the UK said the joint marketing deal that has produced the name Volksmicro for its Alphatronic does not currently extend to the UK, and he sees no likelihood that it will in the future.

This may prove to be short sighted in view of the success of the Beetle.

SOFTWARE

Latest releases

Education/Home

Commodore 64: Home Office is a cassette based program from Audiogenic (0734-595647) that offers word processing and a database system for £12.95.

Commodore 64/Spectrum: Longmans (0279-26721) has launched four more titles in its early learning series called 3D Hypermaths, BMX Number Jump, Word Wobbler and Snap It Up.

Spectrum: Also on the early learning theme are four new titles from Ebury Software (01-439 7144): Mr T's Alphabet Games, Mr T's Measuring Games, Mr T's Shape Games and Mr T's Number Games. Mr T is an animated character who applauds vigorously when a correct answer is given. Bug Byte (051-709 7071) meanwhile is branching out into the catering business. It has signed up the services of a British Routiers chef to produce The Computer Cookbook which comes in a two-cassette pack for £9.50. Martin Dunitz Publishers is making a special offer with its Dyslexia Beater program. You can get a copy of the book Overcoming Dyslexia. Silversoft (01-748 4125) is adding Greek and Italian to its range of Gruneberg system language courses. They are priced at £12.95. Sinclair itself has introduced 'Which? Calculator', a personal tax program that draws on the considerable expertise of the Consumer Association. It costs £12.95.

Spectrum/BBC: GCE/CSE revision courses in English and Maths are now available from Griffin Software (021-236 2552). There are two separate programs for each subject and they cost £9.95 for the Specrum versions and £11.95 for the BBC versions.

Systems/Utilities

BBC: Many companies are seeking to exploit the sideways ROM feature on the BBC micro. Latest releases include Mach1, an assembler/disassembler/machine code editor from Gnomica and a similar product called ADE from System Software (0742-682321). And to keep track of what you have plugged into all the available sockets Watford Electronics has a ROM called Manager that adds another 18 'star commands' to the BBC's operating system.

Sirius-Apricot: Kuma (07357-4335) has a Basic Toolkit that contains 16 different utilities that aims to take some of the work out of writing bug-free programs. The price is £85 plus VAT.

Commodore 64: Also from Kuma is Paintpic, a graphics package that provides all manner of facilities for creating colour drawings. The cassette version costs £19.50 and a disk version should be available in a couple of weeks.

Apple: Vicom is a Prestel package for the Apple that also offers 300 baud communications for use with bulletin boards. It costs £60 and is available from AM Technology (01-937 2810).

Newbrain: Now with Forth-a FIG-Forth implementation is available from Kuma at £35 plus VAT.

CP/M and MSDOS: Take the pain out of writing music scores with Music Mate from MPI (01-591 6511). You can type in the score, transpose parts, change pitches and key signatures and print the whole lot out on an Epson printer.

IBM PC: Venix is an implementation of Unix on the PC and is now available in this country from Cambridge Micro Computers. (0223-314666).

Games

Spectrum/BBC/Electron: In most games once you know the rules for a game you can play. In Enigma from Brainbox Software the object of the game is to find out the five rules it is playing by.

Atari/Colecovision/Commodore 64: Pitfall II: Lost Caverns from Activision is the successor to Pitfall I. In this adventure our hero — Pitfall Harry — goes in search of his cat, his niece and jewels.

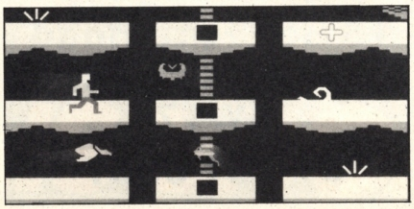
Atmos: New from Salamander (0273-771942) is Classic Racing. Up to six players act out the role of race horse owners. They train the horses, bet on races and earn prize money.

Business

IBM PC: An import available through P&P Distributors (0706 217744) is Infoscope, an information management system costing £175.

Casio FF-200: Kuma has developed a version of its Desk Master 2 word processing program to run on this new machine.

Epson HX-20: Care Software Technology (0734-55521) has launched Care-Link, a program that allows you to use an HX-20 to record data for subsequent up-loading into spreadsheets running on the IBM PC.



Pitfall II — pot-holing from Activision.

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Frenzy	QS	£4.80	**ORIC/ATMOS**		
Fred	QS	£5.90	ATMOS 48K Computer	£160.00	
Astro Blaster	QS	£4.80	ATMOS PRINTER	£140.00	
Chessplayer	QS	£6.95	Rat Splat	TAN	£6.95
Space Int.	QS	£4.95	Oric Munch	TAN	£6.95
Snowman	QS	£5.90	Ultima Zone	TAN	£7.95
Boogaboo	QS	£5.90	Defence Force	TAN	£6.95
Atic Atac	ULT	£5.00	Hobbit	TAN	£12.50
Jet Pac	ULT	£5.00	Oric Base	TAN	£12.50
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PCN CHARTS

GAMES

			GAME TITLE	PUBLISHER	MACHINE	PRICE
▶	1	1	Jet Set Willy	Software Projects	SP	£5.95
▲	2	19	Space Pilot	Anirog	64	£7.95
▶	3	3	Fighter Pilot	Digital Integration	SP	£7.95
▲	4	8	Atic Attack	Ultimate	SP	£5.50
▼	5	4	Manic Miner	Soft Projects/Bug-Byte	SP,64	£5.95
▲	6	9	Hunchback	Ocean	SP,64	£6.90
▲	7	12	Night Gunner	Digital Integration	SP	£7.95
▲	8	30	Code Name Mat	Micromega	SP	£6.95
▼	9	2	Chequered Flag	Psion	SP	£6.95
▲	10	6	Fred	Quicksilva	SP	£5.90
▶	11	11	BlueThunder	Richard Wilcox	SP	£5.95
▼	12	5	Ant Attack	Quicksilva	SP	£6.95
▶	13	13	Bugaboo (The Flea)	Quicksilva	SP, 64	£7.95
▲	14	22	Scuba Dive	Durell/Martech	SP,64,OR	£6.95
▲	15	27	Trashman	New Generation	SP	£5.95
▲	16	—	Flight Path 737	Anirog	64	£7.95
▼	17	15	Rev of MCs	Llamasoft	64	£5.95
▲	18	28	Pilot 64	Abex	64	£7.50
▲	19	24	Snooker	Visions	SP,64,AC,OR	£8.95
▼	20	18	Blagger	Aligata	64	£7.95
▼	21	20	Pogo	Ocean	SP	£5.90
▲	22	26	Twin Kingdom Valley	Bug Byte	64,AC	£9.50
▼	23	21	Forbidden Forest	Cosmi	64	£8.95
▲	24	—	The Boss	Peaksoft	64	£6.95
▲	25	—	Alchemist	Imagine	SP	£5.50
▼	26	7	Chinese Juggler	Ocean	SP, 64	£6.90
▼	27	14	Wheelie	Microsphere	SP	£5.95
▲	28	—	Killer Watt	Aligata	64	£7.95
▲	29	29	Android II	Vortex	SP	£5.95
▼	30	23	Super Pipeline	Taskset	64	£6.90

MICROS

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▲1	2	IBM PC	£2,390	IBM
▼2	1	ACT Sirius	£2,525	ACT
▲3	4	ACT Apricot	£1,760	ACT
▼4	3	Apple III	£2,755	APPLE
▲5	7	Wang Professional	£3,076	WANG
▼6	5	DEC Rainbow 100	£2,359	DEC
▲7	9	NCR Decision Mate V	£1,984	NCR
▼8	7	Olivetti M20	£2,180	OLIVETTI
▼9	8	Televideo TS 1603	£2,640	THORN
▲10	—	Wren	£1,150	PRISM

Top Ten up to £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▶1	1	CBM 64	£200	CBM
▶2	2	Spectrum	£100	SI
▶3	3	BBC B	£400	AC
▶4	4	Vic 20	£140	CBM
▲5	7	Oric 1	£99	OR
▲6	8	Dragon 32	£175	DD
▼7	6	Electron	£199	AC
▲8	—	MTX 500	£275	MT
▼9	5	ZX81	£40	SI
▲10	—	Atari 600XL	£150	AT

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the fortnight up to **May 3.** The games chart is updated every other week.

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT.

Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month.

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Modems should keep at a distance

There are two types of modems — acoustic coupled and hard-wired. The main advantage of the latter is its higher reliability due to immunity from external noise. But both types suffer from one disadvantage — that of proximity. The micro must be relatively near the modem, and hence the telephone connector, and that is not always possible.

There may be a way to combine the advantages of a hard-wired modem with those of portability. Cordless telephones have been around for some time and have the property of being isolated from the main telephone lines by radio. They can be used anywhere within a given range.

If a modem is hard-wired to a handset (not acoustically coupled to it but with direct connections from the modem to the handset) then the resulting system has all the advantages of immunity from noise plus those of portability.

Mark Purcell,
Bletchley, Milton Keynes

PCN £10 Star Letter

Disk drive dilemma

Your answer to A S Maini (Routine Inquiries, Issue 54), was misleading about the difference between 40/80 track and single/double density disk drives.

The difference between 40- and 80-track is 40 tracks, that's to say that the stepper motor that moves the head on an 80 tpi moves the head ½ the distance of a 40 tpi, therefore writing data at 80 tracks per inch.

The BBC disk controller chip (8271) can handle only single density drives, and the only way for it to work in double density is to use a D/D controller, such as an 8272 chip. This lets a disk drive with the correct head write data more compactly to the disk, *ie* almost twice as much to a track and therefore approximately twice the amount of data than on single density.

Approximate figures for bytes per drive are:

single sided
single density — 40 tpi S/S S/D 104100 bytes
single density — 40 tpi D/S S/D 208300 bytes
double sided
double density — 80 tpi S/S D/D 416000 bytes
double density — 80 tpi D/S D/D 833000 bytes

I K Wallace
Enfield Lock, Middx.

You're right — we gobbledegooked, thanks to all who rapped our knuckles. Ed.

Missed points on Microdrive

Gavin Monk's article (Issue 58) missed some vital points on details of cassette to Microdrive program conversions for the Spectrum. Machine code can only be moved by his method if:

- there are no CALLS, absolute JUMPS or absolute addressing to the area of code that has been moved;
- there are no flags or defined bytes which are accessed from within the program;
- the Basic loader, if there is one, has been changed so that it will load from Microdrive instead of cassette, the RAND USR (or whatever) which calls the code has been changed, and the Basic does not access information from the moved code;
- the 'code' does not include a Basic starter which is made to 'run' by saving the system variables with the program.

It is unlikely that any program needing relocation will avoid all these traps, and there are easier ways round the problem. For example, by moving the code up to save it to Microdrive, and then moving it back down again after loading, first ensuring there are no problems that may cause the Microdrive interface to either create its system variables or use its channels, streams or buffers. Alternatively a machine code relocator which checks for absolute addressing may be used to move the code.

Steve Kramer,
Rainham, Kent

Gavin's routine does work, but obviously not for everything. The points you make about the Basic loader were detailed in his article, but thanks for the others which we're pleased to be able to pass on. As ever, we welcome your contributions. Ed.

PCN rearranges the map of Europe

I am pleased to enclose a clipping from *PCN* (Issue 58). Funny thing, I always thought Brussels was in Belgium and not the UK but as I have been overseas for a number of years it may be that it was moved in the county boundary changes which I never fully understood or else maybe another annexation of territory has taken place.

Can we expect to see an appeal to the World Court over this illegal British act of brutally grinding this small country of Belgium under its heel?

David Walton,
Crowland, Cambs

UK EVENTS

Event	Dates	Venue
Compec Europe	May 8-10	Centre International Rogier, Brussels
Computers, Business Systems & Communications Equipment	May 15-17	Bristol Exhibition Centre Canons Road

How to tackle mail order companies

Mr J Hall (Issue 59) refers to Access account and delivery problems. I had this with Sinclair, and while I may not have won, neither did the company.

The procedure I use for mail order is:

1 Mail the order noting the date and keeping a copy. Don't be impressed by clip out order forms, write out your own order and take a copy, clip out and attach the coupon if there is an offer to be gained.

2 Wait 28 days plus a few for postal delays and clerical inefficiency. Write to the supplier saying you have not received the goods and that 28 days have elapsed. You are, however, prepared to extend the period for delivery by 14 days, giving a firm date (not a Sunday) on which the order is cancelled. Post this letter by recorded delivery and keep a copy.

3 The goods arrive after the last delivery date.

If you keep them, stop here.

4 Write to the suppliers informing them you have received an unsolicited delivery of goods from them, you will hold them for 30 days awaiting their collection after which you will dispose of them as convenient and, after deduction of costs, return any monies received (this is the law).

5 The suppliers write asking for the return of the goods and offering to refund postage. It's up to you; do you trust them to refund postage?

6 Your credit card account shows the suppliers have charged for the goods. Don't waste time with the credit card company. Write recorded delivery to the supplier, saying you will sue (small claims) for the sum improperly charged to your account, including costs (your time to make out the claim plus the court's charge for serving the writ — £20-£30).

There are free booklets: 'Small claims in the County Court EX50', 'Buying through the Post Office of fair Trading' from local citizens advice bureaux.

7 Ask the County Court for the forms for the small claims court procedures and help with completion. Put everything in, such as return postage, travel, time, and the cost of serving the writ, which the court office staff will tell you.

The address to which the writ has to be served is the registered office of the supplier. This may not be the mail order address and you may have to get it from the original source of the advert.

8 Hold fire on the writ; the threat is often enough, and you have to pay for the cost. After the writ is served, if the suppliers don't pay up you will go to arbitration.

Finally, Mr Hall might as well pay Access, as the unpaid account may spoil his credit rating. Pursue the matter through the court.

I Arkieson,
Fareham, Hants

Air your opinions, share your experiences or just point out our occasional blunders. If you have an impressive way with words you may gain £10 for the star letter.

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ROUTINE INQUIRIES

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When a 48K Spectrum is not 48K

Q I purchased a 48K Spectrum in January. On the same day I bought a game called *Maziacs*, which is for the 48K Spectrum. But when I tried to load the game, it just stopped at the picture of the game.

So I tried some of my friends' games, and while 16K games work, 48K ones don't. If my model is a 16K one, can you please tell me what to do?
Sanjay Chalisey,
London NW10

A There's a simple way of telling whether your Spectrum is 16K or 48K. Type PRINT PEEK 23733 (return) and if you get the answer 127, you've got a 16K machine, while 255 indicates 48K.

If it's definitely 16K, as it certainly sounds, take it back to the shop and be firm with them. If it's 48K, it's broken, so take it back and demonstrate that it won't load 48K games.

In either event, you're perfectly entitled to demand a replacement machine or your money back. Don't accept an offer of an upgrade or a credit note.

A job for the SID chip

Q I can't seem to find out how my Commodore 64 listens to the outside world. The diagram on page 142 of the user manual shows how to hook up the micro to a hi-fi and this works very well. I'd recommend it to any 64 owner — the difference it makes is unbelievable. What puzzles me is the audio-in pin: I can't find any location to PEEK or register to modify.

Once the audio has travelled up the cable I'd love to find out where it ends up — it could be fun to feed sound in from the outside and process it.
Ian Hay,
Eastbourne, Sussex.

A Your hopes can be realised — you can feed an external sound source into the 64 and process it through the SID chip. The amount of processing is not very large, however. You can take your external sound source and put it through the SID filters but you can't use other features like SYNC or the envelope and waveform generators. The external sound goes from the filters to the volume control and then to the output source where it will merge with the direct output from the SID chip.

Possible sources for external sound include guitars, organs or — most interestingly — other SID chips. Commodore suggests the only limit on the number of external sources would be interference.

The audio-in pin is pin 4 of the audio/video connector. You'll find some technical information regarding voltages and the like on page 472 of the Programmer's Reference Guide and a couple of schematic diagrams on pages 475 and 481. Apart from that it seems as though you need to plug something in and go. Provided you don't zap your 64 with the extra input, experimentation is everything.

Using wax stencils is hot work

Q I was very intrigued by Mr Wilson's letter (Issue 54) on achieving attractive circulars with an Epson printer. I have been thinking of encouraging our local churches along these lines.

There may be one snag — I am told that wax stencils contain acid, which must surely eventually damage the print head if it is not cleaned off regularly. Is it practical for the user to clean the head from time to time?
R P Weaver,
Corsham, Wilts

A On the face of it, Mr Wilson's solution sounds bizarre and dangerous. We feel it would work for at least some dot matrix printers, but that the denser print-heads might present a problem.

Stencils are supposed to be cut by impact, but as print-heads can get very hot it's likely that Mr Wilson is using a combination of impact and heat. So depending on how hot your head is, you might find you're getting some smearing of the wax in addition to getting the letter cut out.

The next problem will be molten wax. At least some of the wax will be vapourised, and will leave a small deposit that may or may not build up to danger point. The rest, we assume, is liable to drip slowly down into the space below the print head. So long as there's none of the works of your printer there, this shouldn't present a problem.

Nevertheless, we wouldn't recommend that you use wax stencils regularly. The consensus at *PCN* is that if you want to do it, use somebody else's printer.

However, Gestetner has been working on a non-wax stencil to work safely with dot matrix printers. Contact the company on 01-387 7021 for details.

Which is the best all-rounder?

Q Which micro should I buy? My price range is around £260 to £300, and I want something both for serious programming and games. I also want good hardware, such as a printer to add on. I'm considering the Atari 800XL or Spectravideo 328 . . .
Andrew Ridd,
Crediton, Devon

A Of the two you suggest, the Atari is currently best for games. The Spectravideo may be OK if a large number of MSX games appear, and if the MSX adaptor for the Spectravideo arrives in this country, but at the moment there's not much around for it.

As regards programming, the Spectravideo's Basic is much nicer to use than the Atari's, but it's hampered by its feeble manual. An advanced reference guide is mooted in the beginner's manual, but again it doesn't seem to have arrived.

As regards expansion, both offer this, at a price. The main difference is that the Spectravideo expands all the way up to a full CP/M machine, but peripherals for both are on the pricey side. At the moment, bearing in mind that neither the Spectravideo nor its software are widely available yet, it might be worth looking at the Commodore 64. Its Basic is about on a par with the Atari's but you can get a good range of enhanced Basics, and the games tend to be cheaper.

Noah's Ark should have had one of these

Q I've been trying to write an 'animals' program for my Dragon for ages, but haven't been able to get it to work. I want a program that asks questions about animals. If it can't guess the animal, it asks you for the animal you are thinking of, then remembers it.

It should also ask you the difference between animals and learn the question.
Paul Andrews,
Altrincham, Cheshire.

A There's a convoluted version of this called 'Pangolins' in the Spectrum manual, but the basic algorithm we give here is quite simple. You'll need to add some error trapping and 'clear screen' to tidy it up. As it's written in standard Microsoft Basic, it should work as it stands on a number of machines and not be too hard to convert to other machines.

Note that you could use it for binary classification of any group of items, such as plants for example.

```
10 DIM AR$(256)
20 PRINT"Here we go...":N=1
30 A$=AR$(N):IF LEFT$(A$,1)="?"THEN
PRINT"Does it
";RIGHT$(A$,LEN(A$)-1);GOSUB
70:N=(2*N)-(K$="N"):GOTO 30
40 IF AR$(N)="" THEN PRINT"I give up.
what is it?":INPUT AN$:AR$(N)=AN$:GOTO 20
50 PRINT"Is it a ";AR$(N);"?":GOSUB
70:IF K$="Y"THEN GOTO 20
60 PRINT"I give up, what is it?":INPUT
AN$:PRINT"enter a question to
distinguish between a ";AR$(N);" and a
";AN$:PRINT"Does a ";AN$;" ";:INPUT
9$:AR$(2*N)=AN$:AR$(2*N+1)=AR$(N):AR$(N)
="?"+9$:GOTO 20
70 K$=INKEY$:IF K$=""THEN GOTO 70
80 IF K$<>"Y" AND K$<>"N" THEN  GOTO 70
90 RETURN
```

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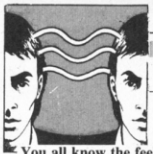

More hints and tips to make programming a little easier.

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Send your contributions to: *Microwaves, PCN, 62 Oxford Street, London W1A 2HG.*

Customise your Spectrum

I have found a simple but effective way of overcoming the fact that the Spectrum has no ON/OFF or RESET switch; that is, install a push-button NMI (non-maskable interrupt) switch. It takes about half an hour to do the job and saves all that wear and tear on the power plug.

All you need is a soldering iron plus solder, a short length of wire, a small screwdriver, and a small push-to-make switch (1.5 A at 12V), which should come to about 75p for the parts.

A wire should be connected from each terminal of the switch as follows.

1 wire to the edge connector 14A

1 wire to the edge connector 14B

The switch can then be mounted in the Spectrum by drilling a hole in the case as desired. Pressing the reset switch at any time will now reset the machine, initialise Basic and the Sinclair logo will be displayed.

Andrew Guest,
Gedling, Nottingham
Note that doing the above will invalidate the guarantee — KG.

When sprites collide on the 64

The following routine may be useful when dealing with sprite/background collisions on the Commodore 64.

Printing to the screen in the same colour as the background results in characters that are not visible but with which sprites may still collide. This can be useful in applications where sprites are required to approach but not touch background objects.

Note, however, that sprites do not collide with shifted spaces (code 96).

S P Rodgers,
Camden Town, London NW1

Spectrum image restorer

Most people know about machine code routines to call a screen image to the screen. The following program does a similar job but is written in Basic. Although much slower, it can be incorporated in Basic programs and called quite easily. It is also fascinating to watch the pictures build up on the screen without a loading pattern on the border.

Once the picture is present, run the following program with GOTO 10.

```
10 DIM a(6913)
20 FOR n = 16384 TO 23296
30 LET a(n-16383) = PEEK n
40 NEXT
50 CLS
60 FOR n=16384 TO 23296
70 POKE n,a(n-16383)
80 NEXT n
```

If only lines 10 to 40 are used, the screen can be saved along with the program, and reloaded with the remainder of the program. Do not use RUN or CLEAR as the array will be cleared from the memory.

Jamie Jones,
Swansea

Oric's complete recovery

Regarding issue 49's Microwaves, 'restoring the Oric Newed program'. This won't work on my 48K Oric. Sure it brings back the program but it cannot be run or edited. Knowing that the end of the program addresses is held at #9D and if one has the foresight to remember DEEK (#9C) and DOKE it back along with Mr Burnhams, DOKE 1281,X, then the program is useable and saveable.

J A Jelly,
Streatham Common, London SW16

Still more Oric calls

To add to the calls in Mr McDermott's letters (issues 36 & 47) for the Oric-1, here are a few of my own.

#E563 — Clears the left 75 per cent of the protected line used for cassette messages.

#EDBC — Clears the HIRES screen, will be faster than using HIRES in machine code.

#C5A2 — Acts like INPUT but without the '?' and stores the characters from #35.

#CCF4 — As above but uses the '?'.

#CC12— Prints out the character in the accumulator.

#C485 — Prints out nearly all the error messages depending upon what is in the X register.

P Abbott,
Stockton-on-Tees, Cleveland

Oric machine-code timekeeper

The routine shown below gives a time elapsed clock at the top of the Oric 1's screen. The time keeping accuracy of this routine varies with program operation and is automatically reset by certain operations such as LOAD and SAVE. The routine occupies part of the alternate character set memory and is transparent to the user. It is interrupt driven and may affect the operation of the warm reset key.

Alex H Homer,
Bracebridge Heath, Lincoln

```
10 FORJ=#BA00TO#BAAE
20 READD:POKEJ,D:CS=CS+D:NEXT
30 IFCS<>21999THENPRINT"LOADING ERROR":S
TOP
40 DOKE#229,#BA00
50 PRINT:PRINT"ENTER 'POKE #BB82,0'  TO
RESET CLOCK":PRINT
60 NEW
100 DATA72,138,72,152,72,173,118,2,201,1
00,48,18,169,75,141,118,2
110 DATA173,130,187,201,48,240,3,32,133,
186,32,40,186,104,168,104,170
120 DATA104,76,3,236,0,0,173,137,187,201
,57,240,6,105,1,141,137
130 DATA187,96,169,48,141,137,187,173,13
6,187,201,53,240,6,105,1,141
140 DATA136,187,96,169,48,141,136,187,17
3,134,187,201,57,240,6,105,1
150 DATA141,134,187,96,169,48,141,134,18
7,173,133,187,201,53,240,6,105
160 DATA1,141,133,187,96,169,48,141,133,
187,173,131,187,201,57,240,6
170 DATA105,1,141,131,187,96,169,48,141,
131,187,96,0,0,169,20,141
180 DATA128,187,141,138,187,169,7,141,12
9,187,169,58,141,132,187,141,135
190 DATA187,169,48,141,130,187,141,131,1
87,141,133,187,141,134,187,141,136
200 DATA187,141,137,187,96
```

Multicolour manipulation

In case many Sinclair Spectrum owners are under the impression that they only have black, white and six colours at their disposal, here is a short program that demonstrates otherwise.

It sets up user defined graphic A as a 'chessboard' design (lines 10-60), then this is printed with different combinations of INK and PAPER (line 100).

Paul Jackson,
Willesden Green, London NW10

```
10 FOR n=0 TO 7
20 READ r
30 POKE USR "A"+n,r
40 NEXT n
50 DATA 85,170,85,170,85,170
60 DATA 85,170
65 LET c=-1
70 FOR x=0 TO 7
80 LET c=c+1
90 FOR y=c TO 7
100 PRINT INK y;PAPER x;"
    AAAAAAAAAA";PAPER 7;" ";
120 NEXT y
130 NEXT x
```

PCN goes east and finds a hive of activity at the East London Amateur Computer Club.

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

Let's get serious

Lectures on Basic, assembler and digital electronics are just some of the latest activities at East London Microcomputer Club where organiser Fred Linger is concentrating on getting members away from games and into creativity.

'We hit on the idea that members should be introduced to writing their own programs and software rather than just buying things ready made up,' he said.

Mr Linger also intends to teach members how to build their own add-ons and electronic devices using step-by-step instruction, and plans are underway to get those started.

Janice McKenzie

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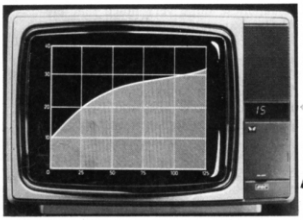

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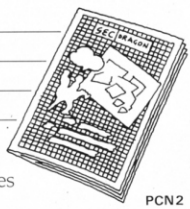


PCN2

Artificial Intelligence is a Japanese national industrial project, says Tom Sato.

Fifth generation

Is the day approaching when we'll see HAL 9000, the computer that went mad in the film *2001*, appear with a 'Made in Japan' label on its back? Or will the Japanese find a better way of using the artificial intelligence they are developing? Either way AI — the development of the Fifth Generation computer system — has become a Japanese national project.

The Fifth Generation computers will be intelligent machines that can learn and reason, draw conclusions, make judgements and even understand natural languages. This last facility will enable computers to act as effective translators, something the Japanese badly need to cope with the language barrier with the West.

The whole project is the brainchild of a group of dedicated computer scientists, including Tohru Moto-oka of Tokyo. University, Kazuhiro Fuchi of Electronics Technology Laboratories, and Hideo Aiiso of Keioh University. They felt that despite various technological breakthroughs in the field of electronics made by the Japanese, they were far behind the United States in original research. Research carried out by the Japanese industries is very much product-orientated, and young scientists felt restricted. At the same time the Ministry of International Trade and Industry (MITI) wanted to coerce the Japanese computer industry into producing original products.

The MITI has considerable power over Japanese industry, and is the driving force behind its economic successes in recent years. A detailed plan for the Fifth Generation Computer project was published in 1981 by MITI which recommended the establishment of ICOT, the Institute of New Generation Computer Technology to carry this through.

Ten year plan

ICOT was formed the following year with Fuchi as head of operations. ICOT itself has only 40 staff, but they are top computer scientists loaned out by eight of the biggest computer companies in Japan. These companies, which include Fujitsu and Mitsubishi, support ICOT with hardware, and when ICOT eventually creates the Fifth Generation computer system these companies will manufacture it.

ICOT divided its ten year plan into three stages. The first three years are devoted to recruiting experienced staff, collating past research and developing the hardware required to make the first step into serious business. The second stage involves developing the first experimental model, and the third the development of full scale artificial intelligence.

ICOT is in its second year. How far has it progressed? Last December ICOT took delivery of a Sequential Inference Machine (SIM), a computer designed with current technology but used as a stepping stone for the development of the basic software for AI. The SIM was pioneered by Mitsubishi, the third largest mainframe manufacturer in Japan. It runs what the Japanese call Version O Kernel Language, an extended version of Prolog. Prolog, developed at Edinburgh University, allows programmers to write more logical and structured programs. ICOT will concentrate on the SIM computer this year.

Software crisis

Conventional computers rely heavily on high speed sequential methods, *ie* they execute statements one after another. The Japanese see the current very large scale integration (VLSI) technology as nearing its limit and the only way forward is to develop computers with new parallel processing architecture. The main hardware for AI, the Parallel Inference Machine (PIM) is now being developed and will replace the SIM computer when the project progresses to its second stage. This machine will enable simultaneous execution of two or more instructions.

So where is all this research leading? To put it crudely, the Japanese are trying to develop a 'thinking computer' which is one step nearer towards human beings. The previous generations of computers had a weakness in that, while the hardware was simple in concept, it required an enormous amount of software. As the power of computers increases more sophisticated software becomes necessary requiring everyone to be a programmer. To solve this 'software crisis', the Japanese are developing a system that can stand on its own two feet. This will be a reasoning computer with a knowledge base, able to understand you without the bother of programming, and able to write its own software to carry out its tasks.

No substantial advances have been claimed by ICOT yet. This is understandable if you consider they are only half way through the first stage of development.

How is the Japanese industry reacting to all this? At a recent symposium entitled 'The Fifth Generation Computers and the Future' organised by the Japan Future Society, various opinions were expressed. Noboru Makino of Mitsubishi questioned the need for Fifth Generation computers at all when humans can reason better than machines. Ai-iso argued that the new generation computers will solve the 'software crisis' and make computers more accessible to more people. Sakyo Komatsu, science fiction writer and film maker, said the Fifth Generation computers should be used for personal use rather than by the authorities. Hajime Karatsu of Matsushita Telecommunication said the computers won't get tired and artificially intelligent computers will be very useful for things such as air traffic control.

Japanese economy

The Japanese are developing the Fifth Generation computers purely for economic reasons, unlike the Americans whose AI program is heavily defence oriented. The Japanese hope very much that the Fifth Generation computers will be used as *personal* computers, and some even say it may not be necessary for mainframes to be artificially intelligent.

The potential income from such micros would be enormous, and would give the Japanese huge advantages in terms of export. It would also render useless all software developed in the eighties. However, if the Fifth Generation computers turn out to be as efficient as hoped, they could start replacing us. Could the SF nightmare come true? Are we going to end up as servants to a huge totalitarian super computer being?

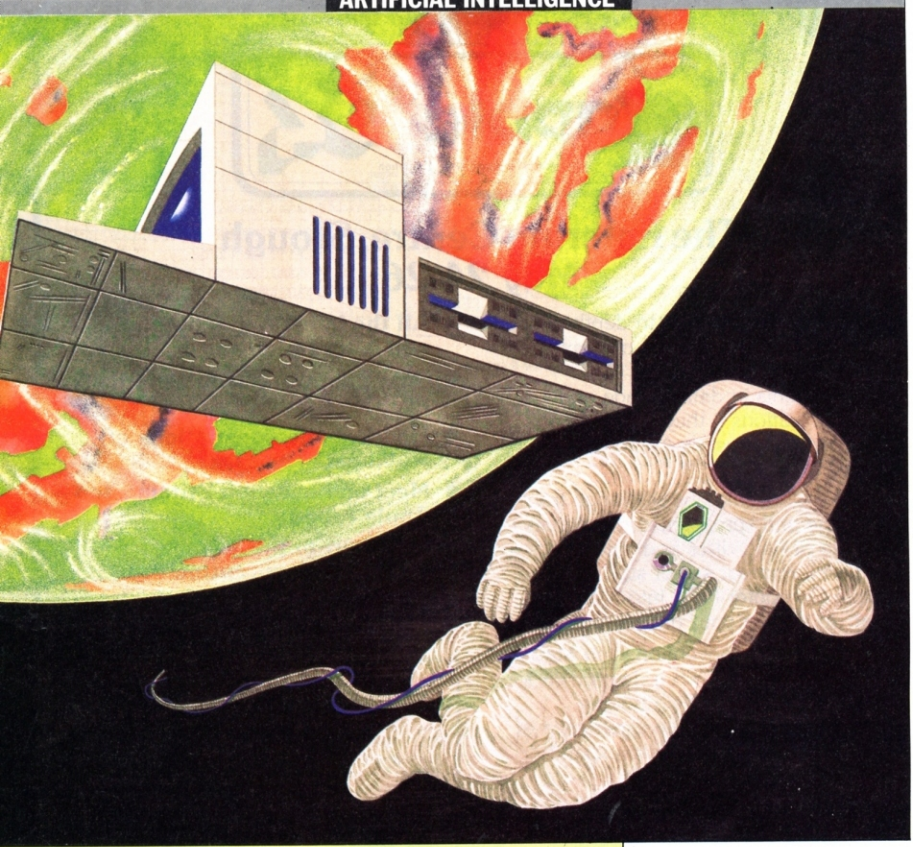
For a start, how will the Japanese cope with AI? There is no doubt that the average Japanese has the same phobias about computers as the average Westerner, but industrial robots were also feared when they were first introduced. The mini industrial revolution of the 1970s gives a few clues to the Japanese response to AI.

Trade Unions in Japan were initially suspicious of industrial robots. They weren't sure about job prospects or what it would be like working with them. The workers now work readily with robots, who do the most arduous work, and they have total control over the robots.

AI could follow a similar pattern when it is introduced. Perhaps the machines will be used extensively in offices, cutting down on the laborious jobs done by secretaries.

However, the big question is will Japanese artificial intelligence have a consciousness and thought process similar to that of human beings? The answer is likely to be no, for the Japanese AI project does not extend to machine psychology. That will have to be left for the Sixth Generation Computer project now being planned in MITI.

The Japanese Government has always invested heavily in industries which guaranteed Japan's future prosperity, whether in cars, shipping or electronics. ICOT is 100 per cent funded by the Japanese Government, which intends to spend between $800m and $1,500m on the ten year plan. PCN



```
10 DIM QA$(256)
20 QA$(1)="AN ANIMAL"
30 R=-1:A=0
40 R=R+1:PRINT "ARE YOU ";QA$(A+(2^R));"?"
50 Q$=INKEY$:IF Q$="" THEN 50
60 IF Q$="Y" THEN 120
70 IF Q$="N" THEN 100
80 R=R-1
90 GOTO 40
100 IF QA$(A+(2^R)+(2^R))="" THEN 180
110 GOTO 40
120 IF QA$(A+(2^R)+(2^(R+1)))="" THEN 150
130 A=A+(2^R)
140 GOTO 40
150 PRINT"WHAT KIND OF ";QA$(A+(2^R));" ARE YOU ";
160 INPUT QA$(A+(2^R)+(2^(R+1)))
170 GOTO 30
180 PRINT"ALRIGHT WHAT ARE YOU";
190 INPUT QA$(A+(2^R)+(2^R))
200 GOTO 30
```

Demonstration program

Very simple programs can be used to demonstrate how computers can be made to appear intelligent. The AI aspect of this program lies not in the program itself but in what replies are given when it reaches a dead end in the tree. There are two of these, one for 'no' and one for 'yes'. When the reply is no and there is nothing further in the tree, the program comes up with 'OK what are you', or some such. For a yes reply and a dead end, the program takes the last question and asks for some descriptive input that describes it more. For instance, on first running the program answering yes will cause the reply 'what kind of an animal are you?'. 'an animal' being the last section of the array QA$ used. To this it is possible to answer 'a cat', but a better answer is one that describes the animal to be aimed at, such as 'a small furry creature' or 'a large scaly brute with fangs'. This gives the program, and the computer, the appearance of asking for clues towards some definite end. The bigger the binary tree and the more well thought out the answers/questions are, the more 'intelligence' the program seems to have.

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PCN

We continue Keith Hook's series on assembly language with a look at the flag register.

Set the flag

In Issue 59, we examined the different registers of the Z80 CPU. Before we look at the various ways in which we address these registers, let's take a closer look at the F or Flag register.

A common CPU operation is the COMPARE instruction, CP in Z80 mnemonics. This works in a similar way to the Basic statement :—

```
10 IF A = 10 OR A> 10 OR A < 10 GOTO
100
```

It allows you to make decisions' then act accordingly by branching out of one routine or jumping into another part of your program. The result of a compare is checked by testing the state of the bits in the F register.

F Register or Flag Register

BIT	7	6	5	4	3	2	1	0
	S	Z	–	H	–	P/V	N	C

C = Carry flag
N = Add/Subtract flag, BCD operations
H = Half carry flag, BCD operations
P/V = Parity overflow flag
Z = Zero flag
S = Sign flag

Bits 3 and 5 are not used. The half carry and N flags are used for Binary Coded Decimal operations, and we are not concerned with them at this point.

The carry flag, if set, denotes a Carry (C) and if reset denotes No Carry (NC) condition. This flag is directly affected by an addition or subtraction. It should be noted that all CP (compare) instructions compare the value contained in the A register with the next operand, which can be a value in a register or an absolute value:

```
CP C ; compare A with register C
CP 40H ; compare value in A reg with 40
hexadecimal.
```

What is actually happening during a compare operation is the value of the compare operand is subtracted from the value contained in the A register.

```
LD A,40H
CP L ;VALUE A —VALUE L
```

The compare operation is essentially an arithmetic operation on the A register, and, as such, the result will affect the carry flag.

The zero flag is set (1) whenever the result of an arithmetic operation results in zero. If the carry and zero flags are used in tandem, any possibility can be tested. Consider the Basic statement:

```
10 LET A = VALUE
20 IF A = 10 THEN GOTO 40
30 IF A > 10 THEN GOTO 50
40 GOTO 40
```

Translating this into assembler:

```
LD A,VALUE      ; put value into A
                  register.
CP 10           ;compare value in A
                  to 10
JR Z,EQUAL      ; if value in A = 10
                  jump to equal.
JR NC,GREATER; if carry flag not set
                  then jump to greater.
LOOP: JR LOOP   ; Value in A is not
                  equal and is less than
                  10.
```

The NC situation will arise if A = 10 or A>10 and so it is always wise to compare A register with a value 1 greater than the value you wish to test for.

```
CP 10 ;
JR NC, NEXT     ;If carry flag not set A
                  is definitely greater
                  than 9 but could be
                  equal to 10.
```

This is why we tested for zero before testing the carry flag in the previous example.

The four situations can be summarised as follows:

N Value in A reg = or > than compared value.
C Value in A reg < compared value.
Z Value in A reg = compared value.
NZValue in A reg J compared value.

Also note that the value in the A register is not affected, and is left unchanged by the compare. The subtraction takes place only to set the F register.

The Sign bit: If you remember the first article, we discussed the 2's complement of a number. In 2's complement notation if Bit 7 = 1 then the number is negative and if Bit 7 is reset (0) the number is positive. The Sign flag reflects the state of this seventh bit.

We can discuss the other flags as they arise, but the three flags already discussed are the most important.

Addressing modes

Any detailed review of a CPU will always mention its addressing modes. This is where the Z80 comes into its own. The wide variety of addressing modes available on this CPU makes life really easy for the programmer. Addressing modes will create no serious problem to you. You will soon become familiar with the most useful, and to help you along that path, here are the more common ways of addressing the Z80.

Immediate addressing: In Basic a similar instruction would be: LET A = 3

```
LD A, 03 or:
LD HL,5007 (known as Immediate Ex-
                tended Addressing).
```

You are loading a register or a register pair with immediate data.

Register addressing: This is exactly what the name implies, one register is loaded from another.

```
LD A,C ; Load A register with value in C
           register.
```

Register indirect addressing: In this mode of addressing, the location of the operand is held in one of the register pairs: BC,DE, or HL. A translation in Basic would be:

```
10 LET BC = 14290
20 LET A  = PEEK (BC)
```

In Z80 mnemonics:

```
LD A,(BC)     ; LD A register with the
                value in the RAM/ROM
                address pointed to by the
                BC register pair.
LD HL,14290 ;Make HL point to address
                in Ram 14290
LD A,(HL)     ;put value into A register
LD DE,15290 ;DE register pair points to
                a higher part of memory.
LD (DE),A     ; Put value from A register
                into RAM memory loca-
                tion pointed to by DE reg
                pair.
```

Indexed addressing: This is a powerful addressing mode. It allows you to retrieve or store data from tables set up in memory. We can make the IX or IY registers point to an address then add an offset within the range of −128 to +127. If the IX register points to memory address 3C00 hex we can LD A,(IX+15) which would load the A register with the contents of memory location 3C0F hex. And LD A,(IX+00) would load the A register from memory location 3C00 hex.

Implied addressing: This mode means that the register is not named in the mnemonic, but implied by it:

```
ADD E  ; The contents of the E register is
           added to the A reg.
SCF    ; Set carry flag.
```

Logical operations

No doubt you have used some type of logical operation in Basic programming. In assembler, logical instructions operate on individual bits within a byte contained in the A Register. Also, the carry flag is always reset by a logical operation. The function of a logical operation is to combine bits, and they never produce 1s unless a 1 is present in one of the operands.

AND works like this: if the matching bits in both operands are set (1), then the resultant bit will be set. The most obvious use for the AND instruction is to mask out unwanted bits in a byte. You would use this if you always wanted bits 0 to 4 to be zero:

```
LD A, FFH   = 11111111 binary
AND FOH     = 11110000 binary
result      = 11110000 binary
```

OR, as its name implies, will set the resultant bit to 1 if either bit in the operand is one.

```
LD A, 96H   10010110 binary
OR 6DH      01101101 binary
result      =11111111 binary
```

XOR, the third operator, means exclusive OR, so if one or other but not both bits are set, the resultant bit will be set.

```
LD A, B6H   = 10110110 binary
XOR F2H     = 11110010 binary
result      = 01000100 binary
```

This series on Assembly language programming will continue in a forthcoming issue.

Apple KuDOS

A powerful new operating system, ProDOS, gives extra polish to Richard King's Apple.

It's been a long time coming, more than two years, but Apple has finally produced a new operating system for the II plus and IIe computers. Even now it isn't on public release, but Apple is setting up licensing deals to sell it here. Buyers will get two disks and two huge, photocopied preliminary manuals, complete with formatting directives.

Called ProDOS (for Professional), the new system is impressive, offering the kind of features you find in MSDOS 2.×, OS9 or even Unix.

Features

What does it offer that its predecessors didn't? To answer that look at the limitations of DOS 3.3, most of which resulted from its having been written piecemeal over the years. This is why it lacks the tight organisation essential to systems programs.

These limitations prompted every programmer to develop a favourite way to use DOS, so many programs wouldn't run together.

At its most basic level, ProDOS is 'properly' organised. It has a reasonably simple, well-defined and consistent user-interface, behind which lie the subroutines needed to do the work, while there's no need to know the operational details. In addition, the $BF page of memory is defined as the System Global Page, which acts as the communication-link between systems programs and the OS, and contains various useful information.

Another important extra provided by ProDOS is memory management. This is related to interrupt-handling, and would not be possible without some way to mark sections of memory as reserved.

ProDOS maintains a 24-byte block in the system-page called the system bit-map. This has a bit-to-page correspondence with the lower 48K of the Apple, and whenever a page or part-page is used or released, the corresponding bit in the map is set or unset. This is caused by file-calls which involve buffer-allocations or releases, using high-resolution graphics, loading transparent routines like editors and anything else which requires space to work in.

DOS 3.× offered little in the way of interrupt-support, beyond disabling them whenever it was reading or writing a disk. It was possible to restore them repeatedly, and this is how most of the clock-cards work, but that's about as much as you could do.

ProDOS gives four polled interrupts, and provides facilities for loading the handlers into memory and linking them into the system. When this has been done, the handlers will be called whenever an interrupt is given, and if more than one handler is installed, they will be repeatedly called in the order in which they were loaded until one of them claims the signal, does whatever, and releases the system for normal operation.

```
        DISPLAY SLOT ASSIGNMENTS

STARTUP DISK: /USER'S.DISK/
YOUR Apple //e HAS:
    64K OF RANDOM ACCESS MEMORY
    APPLESOFT IN ROM
    SLOT 1: EMPTY
    SLOT 2: EMPTY
    SLOT 3: 80-COLUMN CARD
    SLOT 4: EMPTY
    SLOT 5: EMPTY
    SLOT 6: DISK DRIVE
    SLOT 7: EMPTY
PRESS RETURN TO DISPLAY MAIN MENU
```

ProDOS Slot Assignments Display

```
            FILE COMMANDS

        ? - TUTOR
        L - LIST PRODOS DIRECTORY
        C - COPY FILES
        D - DELETE FILES
        K - COMPARE FILES
        A - ALTER WRITE-PROTECTION
        R - RENAME FILES
        M - MAKE DIRECTORY
        P - SET PREFIX
SELECT AN OPTION OR <ESC>:
```

The ProDOS File Commands Menu

Interrupt-removal is also provided, so one-time events can run when needed, then go away. Time is also a system-resource. Clocks are considered an integral part of the machine, so files can be date/time stamped, and timed interrupts can be handled. If a clock which conforms to the Thunderclock definition isn't available, the system plonks <NO DATE> on everything instead, but the clock-driver can be replaced by a user-supplied routine, which is required only to store the date/time in $BF90—$BF92 whenever it's called.

One of the Unix-like features of ProDOS is hierarchical file-management which, coupled with extended file-types, transforms the disk drive from a simple dump for anything which isn't inside the machine into a valuable resource which can organise data and programs into more efficient systems.

A criticism of the Apple is that file-sizes are limited, partly by the small (143K) size of the normal drives, and partly by the fact that DOS 3.3 won't allow more than 32767 records in a file. You can install alternative Read-Write Track-Sector (RWTS) routines and patch the file-manager and command-handler, but the result is messy.

Of course, you can use another OS, but this is escaping rather than solving the problem and moreover, you'll probably find you can't run the program that wants the big files in the first place.

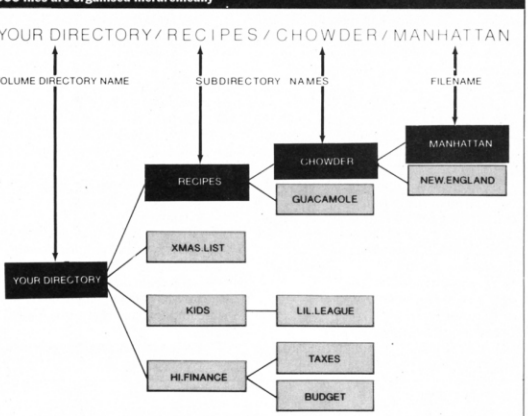
With ProDOS the disk has a driver-routine, so changing the drive doesn't cause many problems . . . all you have to do is link in a new routine, and since the rest of the system will handle files of up to 16Mb, you're away.

Drivers are used for all the other I/O devices too, so it should make those awful systems with bits of code all over the place a thing of the past, and in theory, almost any printer, plotter, clock, modem or computer-controlled bread-buttering machine should be usable from any program.

Operation

How you make it do what you want depends on how low you want to get! At bootup there's not much difference between ProDOS and DOS 3.3 . . . you work in Basic and most DOS-commands work in

ProDOS files are organised hierarchically



the same way, requiring a CTRL-D to activate them from inside a program.

There are extras, though. CATALOG lists the enhanced directory, complete with file-creation and modification dates, subtypes and so on. CAT gives a shortened version, suitable for 40-column displays.

The most obvious alteration is in the filenames. Correctly, these aren't file names anymore, and Apple now calls them 'pathnames', a term derived from hierarchical directories. Since any directory may contain either files or other directories which may in turn contain further directories, the actual data is at the end of a path, hence the new terminology.

For much the same reason, drives are not referred to by slot and number. It is possible to do this, but it's been retained only for compatibility. Under the new system, the title of each disk is the name of its outermost directory.

While ProDOS has little in common with its predecessors, it's made to look like the older DOS by a 'system program' called Basic.System, which is a command-interpreter.

Apart from Basic.System, there are other SYS-type programs; you can even write your own. In most respects, such a program is a normal file, with the special feature of always loading at $2000 before moving itself or being moved to its execution location, as well as conforming to strict entry and exit conditions.

This lets ProDOS emulate any other operating system, just like Unix can; but then it also doesn't. In fact, this seems to be the weakest feature of ProDOS as it now stands . . . the main command-processor emulates DOS 3.3 very well . . . too well, perhaps, because there are many facilities which Basic. System just won't let you get at, or if it does, only with difficulty, often caused by too slavish an adherence to the behaviour of DOS, complete with limitations.

There is considerable room for development here, and it is to be hoped that more advanced CCPs will be developed such as a Bourne-type shell for the Aztec-C system to give a system which, to visible signs, was Unix on an unadorned Apple.

With ProDOS you get the Developer's Head-start Kit, to actually obtain ProDOS itself and two versions of Basic.System. One of these provides a development environment for Applesoft Basic, and the other functions as a run-time environment, which precludes the use of most DOS commands in immediate mode.

There are two file-management programs; Filer, which is an advanced version of Fid, and Convert, which transfers files from DOS 3.3 to ProDOS and vice versa. Four program-development tools are provided, consisting of an upgraded version of the Apple EDASM machine-code development system, with a not-so-good line-editor (why not a proper screen editor?), the very professional relocating macro-assembler, plus a relocating loader which makes little use of the relocation dictionary produced by the assembler, and falls short of the link-editing facilities provided by other operating systems.

However, a big plus is a new member of the family, Bugbyter. This is a smart debugger/front-panel with multiple conditional breakpoints, single-step, trace, register and memory operations and more besides.

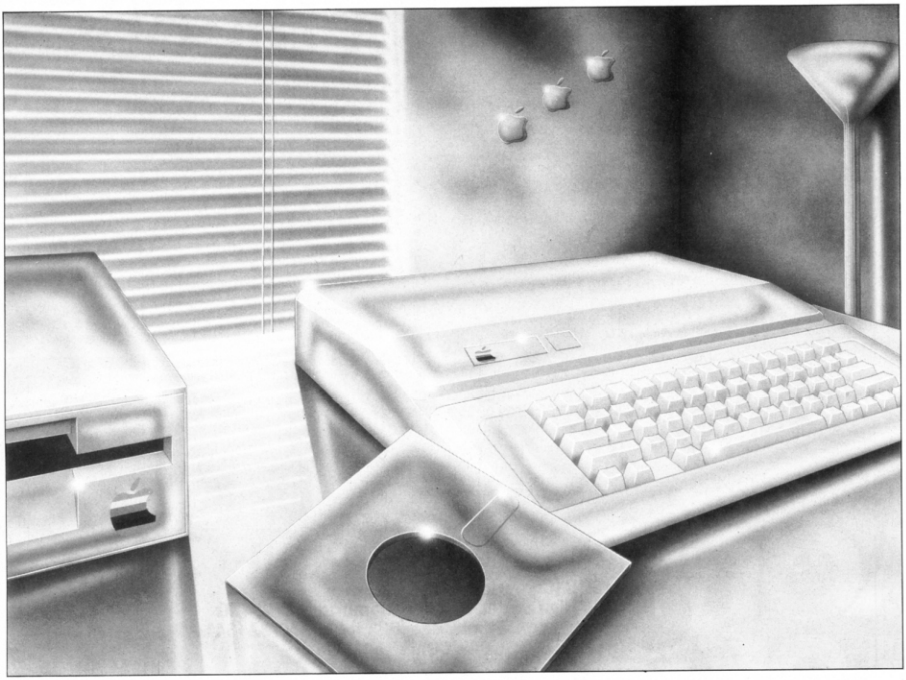
As suggested by the presence of CONVERT, the organisation of the disks is different from that used by DOS, and is similar to that employed by SOS, if not identical. Certainly ProDOS is claimed to read and write SOS disks, though it won't necessarily make you wiser because you can't run SOS Pascal or Business Basic.

Verdict

The Head-start Kit, which I tested, is openly proclaimed to be 'Beta code — that means there are bugs'. That's what it says in the manual, but I can't say I noticed any serious ones.

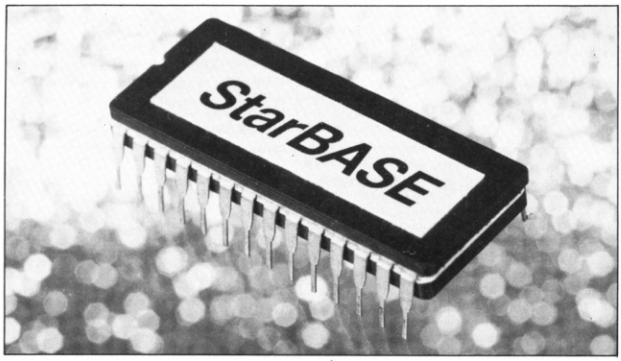
In general, I found the experience pleasant. It's a considerable improvement and should greatly enhance the usefulness of the Apple. PCN

Name ProDOS **Price** £35 **System** Apple IIe, II+ (64K) **Application** Operating system **Supplier** Apple, 0442 60244 **Outlets** Apple dealers



Mark Watkinson

StarBASE... a new database



StarBASE... for the BBC

The StarBASE professional database management system consists of a 16K ROM, 51K of extension and applications software on disc and a comprehensive manual. StarBASE was designed by a chartered electronics and software engineer to meet a defined need for a high specification, disc-based random access system. The database program and extension software is "Menu Driven", particularly user-friendly, quick to use, but extremely powerful and totally flexible. It is absolutely ideal for use in schools, clubs, colleges, small businesses and in the home.

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- Up to 4096 records.
- Records are displayed and input on a "Card Screen" principle. Layout of fields and headings are built entirely by the user by "Painting" on the screen (colour can be used).
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Chess challenge

Bob Chappell looks at a chess program from CDS Micro Systems and says it's a colossus in its field.

This chess-playing program is a pearl; it not only plays a high standard of chess but has more built in features than any other currently available chess program. Not too surprising, perhaps, since it was written by Martin Bryant, author of the 1983 microcomputer chess championship winner.

Presentation

Colossus comes on a cassette tape in a large and handsomely liveried, video-style case. A 16-page glossy booklet provides full and clear instructions.

Displays

Either of the two full-screen displays can be instantly called up at the touch of the space bar. One screen shows the board, complete with border annotation, neatly designed chess pieces and an area for the program's messages and prompts.

The second screen holds a record of the moves, players' names and chess clocks. A set of technical data indicates to what depth the computer is currently searching (it has a maximum of 14 ply lookahead at its highest level), the best line, the evaluation of that line (material and position), and the total number of positions examined. The best line is particularly useful as a hint facility for your next move.

Modes

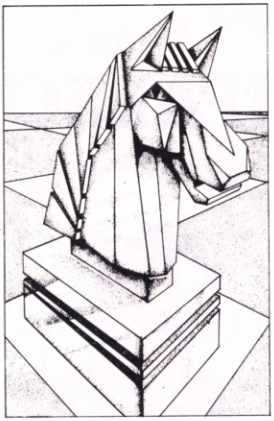
There are six modes to choose from; each controls the speed of response and consequent playing ability. Mode 1 offers full tournament timings (number of moves by, and times of, the first and secondary time controls). Mode 2 merely requires a single parameter, the amount of time the computer has to make a move — this effectively gives thousands of levels of play since the maximum limit is 59 minutes, 59 seconds.

Mode 3 offers a time limit for completing the game while mode 4 sets Colossus playing at your speed. Mode 5 lets the program keep searching until one of four things happens — it exhausts all combinations of moves, reaches it maximum depth of search, finds a mate or is stopped by you. Ideal for postal chess or for trying to find the best move in a given position when time is not of the essence.

Mode 6 is for problem solving. Once you've set up the position not only can Colossus find any mate in up to seven moves for either side (and quickly, too) but, uniquely, it will solve self-mating problems just as easily. I know of no other program that has this capability — on the other hand, self-mating problems are not too common.

Operation

Pieces can be moved around the board two ways; by manipulating a special cursor



across the 'from' and 'to' squares or by using standard algebraic notation (*eg* E2-E4). With both methods, the 'from' and 'to' squares flash before the piece is moved on the board.

Setting up a board position is simple. The board can be wiped clean and individual squares cleared or set up with any piece. If you've made a mess of it, you can easily retrieve your original position. You can even set up an 'invisible' board if you're one of those geniuses who plays blindfold chess.

There is an abundance of simple, user-friendly facilities. All have pre-set default values and all can be accessed during the game:

- Change border, background and foreground colours.
- Step back and forward through the moves. If you make a mistake or want to replay the game from a certain point, the stepping feature is perfect.
- 'Action-replay' of the whole game, at a speed set by you.
- Save a game to tape to replay or resume later.
- Let Colossus play against itself.
- Interrupt Colossus while it is thinking, forcing it to play its best move found so far.
- Make Colossus play a move for you.
- Change sides.
- Switch the board around, enabling you to play white or black up or down the board.
- Reset the clocks to zero.
- Play against someone, with Colossus acting as move validator.
- Start a new game (two keys are used to avoid accidents!).
- Adjust the volume of the program's 'beeps' via the keyboard.
- Display all legal moves available to a piece — a useful teaching aid.

Colossus Chess commands

A	Alter position
B	Back-step (review/alter previous position)
F	Fore-step (see Back-step)
C	Colours (ink, paper, border)
E	Elapsed time clocks (setting)
G	Go — force move for current side
I	Invisible — blindfold mode
L	Legal moves shown
M	Mode — six options
N	New game
O	Orientation (play up the board)
P	Play-self — micro plays both sides
R	Replay — whole game, settable pause between moves
S	Supervisor — you play both sides
T	Tape — save/load move-records
V	Volume — settable from 0 to 15

In play

The program has an apparently comprehensive opening book, some 3000 moves according to the publishers. The instruction booklet gives a list of impressive results against many other leading chess programs such as White Knight (BBC B), Grandmaster (CBM 64) and Cyrus IS Chess (Spectrum). I tried it out against a number of these and my limited trials left me in no doubt that Colossus was the stronger program.

A further professional touch — should one of your pawns reach the back rank, you choose the new piece instead of automatically receiving a queen.

A minor blemish, but one to note, is that the chess clocks appear to run faster than real time. For example, although Colossus' clock may indicate that it has taken, say, 10 seconds to respond, in reality the elapsed time is less.

Verdict

The best chess program I have seen with its high standard of play, abundance of useful features and extremely competitive price. It may well turn out to be the program of the year. PCN

RATING (/5)

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

Name Colossus Chess 2.0 **System** Commodore 64 **Price** £9.95 **Publisher** CDS Micro Systems, Doncaster (0302) 744129 **Format** Cassette **Language** machine code **Other versions** none **Outlet** Most retailers.

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DRAGON DYNAMO

An integer compiler runs rings around Bryan Skinner's programs

As if the Dragon's 6809 isn't fast enough already, Oasis Software has now released version 1.1 of Sprint, its Basic compiler. The 6809 may be a fast processor, but Dragon programs don't run half as fast as Beeb ones, so maybe there's room for this 'go-faster' package.

Sprint is an integer compiler; programs dealing with real numbers (*ie* decimals) will prove a headache. Sprint speeds up most of your programs, and it doesn't compile to assembler but to an intermediate code.

Presentation

Sprint comes in a large plastic wallet with yellow and orange Porsches on the cover. There are two tapes: the first has two copies each of the control program, the compiler itself and a linker. The second has a version of three-dimensional noughts and crosses, with the compiled version for comparison.

Two manuals are provided, the main one (31 pages) and a supplement for version 1.1. The print in both is small, there's no index and it's none too easy finding information, but they're adequately detailed. There are numerous examples of programs to compile with explanations of problems that may arise.

Getting started

First write your program. Then adjust it to make it compatible with the compiler which, truth be told, compiles a subset of Dragon Basic, albeit quite a large one.

First you must dimension strings early in the program. This involves finding all the strings used, working out their maximum lengths, then 'declaring' them as in '20 REM$ A$ [20], LL$[254]' and so on. The default string length is 32 characters, and REMs indicates a 'compiler directive'.

The next thing to do is alter any CIRCLE commands. Because Sprint is integer only, you might expect it not to handle 'reals' used in Dragon commands like CIRCLE *eg* height-width ratio, but it does. You must express the last three parameters of CIRCLE as integer fractions, so CIRCLE (10,10),10,.2,0.5,0.3 becomes CIRCLE (100,100),10,,(128)/64,(32)/64,(19)/64.

Sprint can't cope with SIN, COS, LOG, exponentials and related functions. Nor will it tolerate the X substring command of PLAY and DRAW.

On the plus side, version 1.1 has full cassette file handling. There's also EXEC@, which allows you to put machine code subroutines into an array, then call them.

You must take care with PEEK and POKE, as integers in Sprint are in the range -32768 to +32767. But that's not all. I compiled a game I'd written, but the keys no longer had an effect. The program didn't use INKEY$ because it gives a 'once only' reading, so I was PEEKing addresses 341 to 344 to check if arrow keys were held down. Sprint doesn't poll the keyboard in the same way as the normal interpreter, so I had to rewrite the keyboard routine using INKEY$. The game goes faster, but now the player has to hammer at the keyboard.

Before saving the program (in ASCII format), you must RENUMBer it as 0,1,2,3 etc. The last line shouldn't contain an IF clause; if it does, you must add a dummy last line. Finally, you must remember the highest line number.

'Basic vs Compiled RUN-times (secs)'

TEST	Basic	Sprint
10,000 FOR . . . NEXTS	12	2
10,000 GOTOS	119	9
10,000 ADDITIONS	40	7
5 FILLED CIRCLES	14	13
VARIOUS MATHS	9	1

In use

When you think you've got an ASCII version of your program that will compile correctly, you run the first program which loads the compiler. You're then prompted to insert your program tape, and when the header is read you enter the highest line number, if you can remember it. If you type a wrong number you can't use the left arrow key to delete it for alteration. If you've not pressed ENTER, you can get the prompt again by entering a too high number. Not user-friendly.

Sprint attempts to compile your program, picking out errors as it goes. Error reports are numbered and there's a comprehensive list of their meanings in the manual. You can have the compiler output sent to a printer. After each error found, you press a key and the compiler continues.

If no errors are found, you load the linker, then you've the option of saving your compiled program to tape, and/or seeing it in action. It can later be reloaded and RUN with CLOADM:EXEC and the break key is disabled.

If there are errors, you CLOAD the ASCII version, make the necessary alterations, save it to tape and try again.

A compiled program may crash if you've not debugged it thoroughly under the Dragon interpreter, a variable exceeds the allowed range and so on. When this happens, you get either a standard Dragon error message or one from Sprint's run-time code.

Oasis sticks a copyright notice in the compiled program which pops up briefly when you EXEC it, so if you want to market it, get in touch first.

Verdict

It took me about an hour, all told, to modify and successfully compile a 100-line game which used graphics, strings and sound. At the end, the program ran about five to ten times faster.

I ran Sprint through five short routines to compare compiled against Basic speeds (see table). Improvements were from virtually nothing to 13 times faster. You can increase the speed of compiled programs by altering compiler directives (the maximum improvement I could get was 17 times faster than Basic.) If a program makes a lot of ROM calls *eg* for graphics, there's little point compiling it. If, however, you have a lot of maths, string slicing and/or GOTOs, you'll really notice the difference.

Sprint is a neat package and Dragon programmers should give it serious consideration. PCN

RATING (/5)

Features	
Performance	
Documentation	
Reliability	
Overall value	

Name Sprint **Price** £14.95 **System** Dragon 32 **Publisher** Oasis Software, Alexandra Parade, Weston super Mare, Avon (0934) 419921 **Format** Cassette **Other version** None **Outlets** Mail order

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2 What is the maximum memory that a Z80 can address? .....
3 By when did Acorn originally promise to deliver the Z80 second processor? .....
4 What do the letters CPN stand for? .....

Name .....

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advanced features as the RX-80 but having both friction and tractor feed as standard, it's a totally versatile machine at a thoroughly realistic price.

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Power to your Beeb

David Janda plugs in a RAM board that can multiply the power of your BBC.

ROM-based BBC software is coming almost too thick and fast: a sophisticated solution to the problem is now available. Solidisk's sideways RAM system allows you to dump ROMs onto disk before using them one at a time in the machine. In its most sophisticated form, the one reviewed here, the system also gives you a silicon disk, with very fast access times.

Setting up

The Solidisk system is hardly plug in and go. You don't need a soldering iron but you do have to delve into the BBC. And although the hardware is not hard to install, much use must be made of the utilities disk provided, which contains the programs needed to initialise the system and set up the silicon disk.

Features

The system comprises three pieces of hardware. The main part is the long thin Solidisk board which plugs into a base board, which in turn plugs into the BBC's rightmost ROM socket. The third piece is a mini-ROM cartridge, used to transfer existing ROM-based software onto disk. Either this or the Solidisk board plug into the base at one time.

Several leads from the base board must be inserted into ICs and links on the main board of the BBC. This can be done by removing the ICs and then slotting them back in with the wires in the holes without soldering. However, you may prefer to solder them in if you're going to move your BBC around.

PCN looked at the 128K version of the sideways RAM card, which had the optional silicon disk extension.

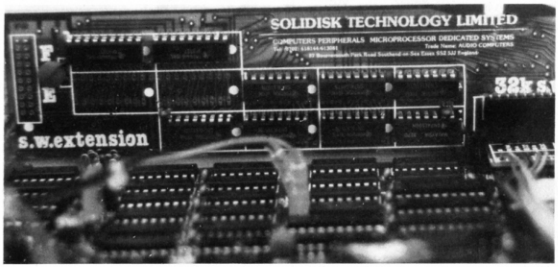
The well-designed card fits along the side of the BBC, where it stays out of harm's way.

Documentation

Installing the system took much longer than necessary. This was largely due to the documentation. The 16-page manual supplied is inadequate for a product this complex.

As well as brief operating instructions a short description of the utilities is provided on the disk. But some programs were not even mentioned, and are still puzzling.

A help file on the disk gives a little more information, including that a 300-page manual is due for release, which will cost £9. This will presumably contain comprehensive information about the board, but perhaps this should be supplied as standard.



The Solidisk sideways RAM — 128K RAM and extra speed too.

In use

Initially, the most obvious use for the sideways RAM is to move the disk workspace onto the board. This means you can move the page back down to &E00, and run normal tape software without trouble. This is done with one of the programs provided on the disk, which also allows you to increase the number of file entries on a disk from 31 to 154.

Word processing can be made both easier and faster using a supplied program that allows you to increase the text workspace with Wordwise up to 64K.

But it's the speed at which files are saved or loaded from disk that really stands out. Programs are loaded in before you can lift your finger from the Return key (as claimed in the advertising, in fact.)

In particular the performance of the silicon disk with Spelling Checker made normal floppy disks seem very slow by comparison.

The silicon disk's only problem is that it is not a permanent storage medium, and if you switch off the BBC without backing up onto normal disks then you will lose anything stored on silicon.

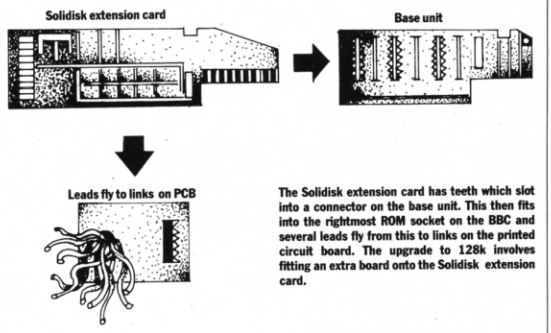
Verdict

The Solidisk system is a welcome good value addition to the increasing range of BBC peripherals, and enhances a good machine.

However, it would be additionally welcome if major utilities, such as the RAM filing system and the silicon disk, were in a ROM. Although this may seem contradictory, it would save some of the time spent transferring the information from disk. PCN

Product Solidisk sideways RAM system **Price** £150.95 for 128K system £58.95 for 32K system £42.65 for 16K system. All prices include VAT and p&p **Manufacturer** Solidisk Technology, Southend-on-Sea. Tel: (0702) 354674 **Outlets** Solidisk **Requirements** BBC model B with disk interface.

Slotting the Solidisk in:



The Solidisk extension card has teeth which slot into a connector on the base unit. This then fits into the rightmost ROM socket on the BBC and several leads fly from this to links on the printed circuit board. The upgrade to 128k involves fitting an extra board onto the Solidisk extension card.

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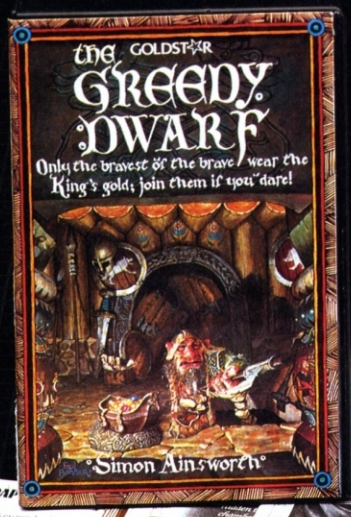

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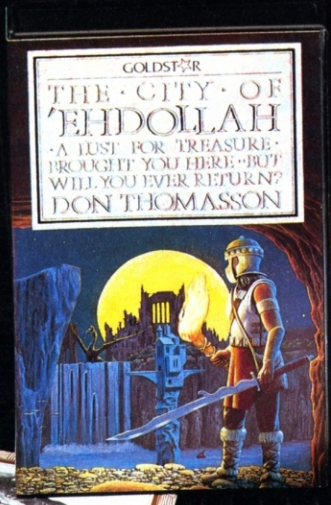

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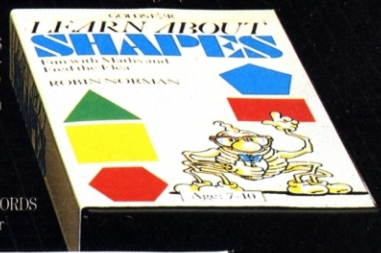
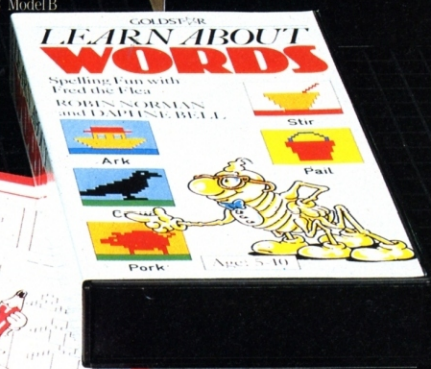
cassette version, ZX Spectrum (48K),
BBC Model B, Commodore 64, Dragon 32





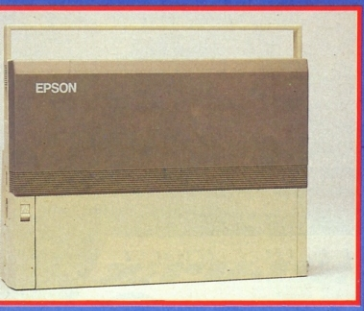
Setting the standard for today's computer user

EPSON ELABOR

Epson streaks back into the portable micro race with the PX-8.

Peter Jackson rates it ahead of the field.

It must have been galling for Epson to find its ground-breaking HX20 lap-held computer being overtaken by the Kyocera bandwagon containing Tandy and NEC. Not to mention the brand new bandwagon started by Sharp with its MSDOS and bubble memory portable, the PC-5000, already reviewed in *PCN* (issue 51).



These machines have more memory, bigger and better displays, and bundled software, and the HX20 found itself relegated to being built into Daimlers as an executive toy.

The PX-8, first shown at Hanover and launched in the UK this week, is Epson's long-awaited response. All the Kyocera and Sharp lessons have been learned, and the founder of the market is back in there slugging.

Above: Cased up the PX-8 could easily pass for a large radio, complete with its pull out carrying handle.

By attaching a flat unit to the base of the portable you add 120K of RAM

ATES

In fact, the PX-8 leapfrogs all the competition except Sharp and is cheaper than that upmarket machine. It forms the heart of a complete system, with 64K RAM, 80-column by eight-line LCD display, and battery-powered acoustic coupler, printer, and 3.5in floppy drive options. The company claimed before launch that it would be offering a complete CP/M system including a set of standard software for around £1,200. That doesn't sound too great, but *this* CP/M system will fit inside a regular briefcase.

First impressions

Looking at the specs, the first thing to meet the eye is that the PX-8 is a real CP/M machine, with that familiar Digital Research trademark message all over the place. And the decision to go CP/M has governed the hardware that goes into the box. It has also brought the desktop battle between Digital Research and Microsoft into a new area — Tandy, NEC, and Sharp all use operating software from Microsoft — but that's another story.

In particular, using CP/M means that the main processor in the PX-8 is a Z80; or, to be more precise, is a "Z80-compatible CMOS CPU." Two extra CPUs do special jobs in the machine, a 6301 "slave CPU" with 128 bytes of RAM and 4K of ROM on chip, and a uPD7508 sub CPU". The 6301 (the main processor in the HX-20) controls the display, with 6K of external video RAM holding the screen contents, and the sub-CPU works down at the deep system level with its 4K of ROM handling the power supply, the keyboard, and the on-board analog-to-digital converter. One thing the sub-CPU *does* do is, the master reset; pressing the sub-CPU reset button puts the big stop on everything in the machine, and should be avoided except *in extremis*.

Inside the basic case is 64K of user RAM and 32K of ROM holding CP/M 2.2 and the other operating routines. Another 64K of ROM space, in the shape of two sockets for 32K chips, is also provided. Interestingly, since CP/M is basically a disk operating system, up to 24K of the main 64K RAM can be set to act as a RAMdisk drive that CP/M treats as an ordinary disk drive. The default is a 9K RAMdisk segment, but the user can change this to any value from 0K to 24K.

Interfaces are on board for the built-in microcassette drive à la HX20, two serial ports, a bar code reader, an external loudspeaker, and analog input. Epson is particularly excited about the analog input, and sees the machine being used in industrial control applications.

One of the two serial ports goes up to a speed of 38,400 bits per second, and is intended to connect external floppy drives, either battery-powered 3.5in or mains-powered 5.25in. This can also drive a printer at speeds of 4800, 600, or 150 bits per second. The other port is for RS232C hardware, and this goes up to 19,200 bits per second for connection to acoustic couplers, modems, or other computers. Unfortunately, both ports have extremely non-standard 8-pin DIN-style sockets so the interface cables will have to come from Epson itself. The company has a range that fits, covering the different hardware that can be plugged in.

At left: Epson drops into the market with serious competition for the whole range of existing portables. Full keyboard, built in cassette and 80 column screen are among the visible features. Inside is a real computer, ready to do business.

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EPSON ELABORATES

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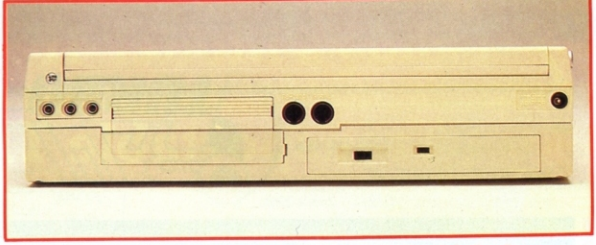
The system bus also comes out to a connector in the back panel, and this is the key to the PX-8's outstanding feature. An external box screws on the bottom of the main case and plugs into the bus, and gives an extra 60K or 120K of RAM that the machine treats as a disk drive. If this is fitted, it stops any of the main RAM being used as a disk as described earlier; but I'll come back to the RAMdisk features of the PX-8 when we get to the software, since it governs the way the machine actually works.

The hardware is solidly made and seems from a few weeks' hard use to be as reliable as Epson kit normally is. A lot of work has gone into the system design, and in fact one ex-Epson executive told me that the Maple — the internal codename of the PX-8 — could have been out a lot earlier. My feeling is that the company, with typical Japanese thoroughness, wanted to get the machine and its supporting add-ons exactly right before launch. At least we haven't had the kind of launch the Sharp PC-5000 had, where the machine was shown at the NCC in California last May with no-one, least of all Sharp staff, knowing when it would be out or what the price would be.

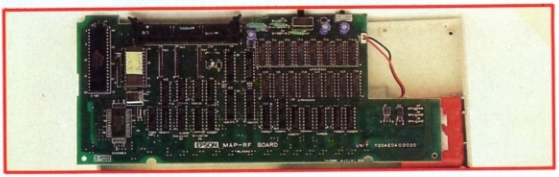
My review machine came out of stock at Epson UK, and despite its low serial number (000026) I am assured that it is a full production model.



RS232C, serial, analog and barcode interfaces are provided as standard – the ports for these lie along the back of the machine.

Lifting the screen reveals the built-in microcassette drive, the feature that distinguished the HX-20 from its later competition. The introduction to the manual informs us that 'Microcassette' is a trademark of Olympus Seiki, and the tapes supplied with the review machine did indeed have Olympus labels. But they seemed standard enough.

Without the wedge-shaped RAMdisk add-on the machine sits rather flat on the desk or lap, so two swivelling stands are provided to tilt the keyboard to a more convenient position. Fitting the RAMdisk covers these stands, but the way the add-on box is shaped does the same job. The RAMdisk case is also designed to leave the ROM slots free, and a small clip-on panel under the keyboard gives access to these.



The extra RAM is all fitted onto one circuit board containing no less than 39 chips and an extra 120K.

Delving around in the packaging brought up two very hefty A5 manuals and an AC adaptor, but since Epson had thoughfully put in the NiCdmain battery pack I just turned on the main power switch on the side of the case to see how CP/M looked on a battery-powered machine.

After a beep from the on-board loudspeaker — the volume control is next to the power switch — the initial display comes up on the LCD screen. As with all LCDs, the angle of view and lighting of the display are critical. A view angle slide control is mounted on the display surround, and I found that the best results came from tilting the display a long way back and changing the view angle switch to give the highest contrast possible. This makes best use of the ambient light, and gives a clear display of a very legible character set.

As with the NEC and Tandy machines, the first display was a menu of available files. However, here the files look like a standard CP/M directory — with a few important changes. Instead of getting just the directory of the current logged drive, the menu gave a list of all the files in the system with the CP/M 'COM' extension denoting machine code programs. That included, according to the menu, files on drives A:, B:, and C:. Time to look at the manual to find out how these drives are arranged.

As it turns out, the arrangement of the drives is up to you, and you can even select the files that appear on the initial menu by entering which file extensions have priority, and which 'drives' the menu files are to come from. Pressing Control-Help brings up a separate system control menu that lets you set the initial menu contents, as well as allowing the entry of things like a system password, and the setting of alarm or wake times. The alarm function interrupts any program at alarm time and puts any required message on the screen; the wake function starts running any program at a set time: useful to telephone a file to Japan in the middle of the night.

The default disk configuration has the RAMdisk, either external or internal, as drive A: The two 32K ROM sockets are drives B: and C:, while the microcassette drive is drive H:. Two other configurations can be selected, which put one or two external floppy disk drives at the top of the list as drive A: or drives A: and B:. Up to four external floppies can be fitted, but the second pair are always at the bottom of the list as drives F: and G:. In all configurations, H: is the microcassette.

Microcassettes allow you to safely save your data.

The system menu is built-in, but the disk configurations are part of a much bigger configuration program supplied by Epson as part of its stack of ROM-based software.

In use

On first sight, the travelling PX-8 looks like a transistor radio, or some kind of high-tech handbag in two-tone beige. But sliding off a cover reveals the familiar HX-20-style keyboard, and the carrying handle slots neatly in under the keyboard and disappears from view. A sliding catch releases the screen and it can be clicked round its pivot to the desired viewing position.

Even this simple operation gives a hint of Epson's attention to detail; a small spring-loaded stud forces the screen up slightly when the release catch is pressed, just to make it easier to lift the screen. And the edge of the screen is fluted, with a thumbnail slot, to make it easier still.

The screen pivot is very solid and showed no signs of loosening at any angle during use. Epson provides a screw at the end of the hinge, presumably for tightening the pivot, but I had no need to touch it.

Software

Tandy and NEC launched their Kyocera-made machines with bundled software from Microsoft covering Basic, word processing, diary, rudimentary database, and communications functions. But Epson's use of CP/M means it can bundle in

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EPSON ELABORATES

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the same functions using standard and familiar packages. Most of these come from MicroPro in the US, who have supplied Portable WordStar, Portable Scheduler, and Portable Calc in collaboration with Epson. Epson itself provides a communications package called Term, and a file transfer package specifically designed to swap files between the PX-8 and Epson's QX-10 desktop machine.

And Epson UK has struck its own deal, to bundle Business Simulations' Cardbox Plus database package with the PX-8.

The lateness of this last deal meant that Cardbox Plus for the review machine was supplied on microcassette, but all the rest was supplied in ROM cartridge. Actually, cartridge is too strong a word since the 32K ROM chips were simply fitted to plastic chip carriers to fit in the spare ROM sockets under the keyboard. There were four ROMs in all; one with the Microsoft/Epson Basic, one with WordStar, one with Portable Scheduler and Calc, and one full of CP/M utilities.

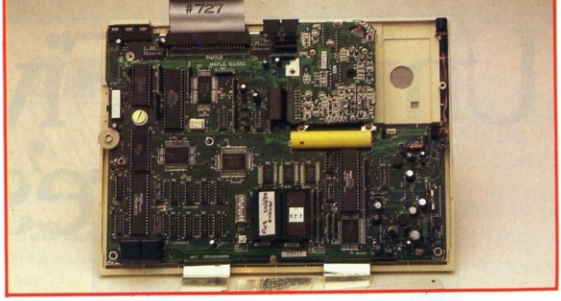
It's obvious that four ROMs into two sockets won't go, but with the big 120K RAMdisk fitted that is no problem. Files can easily be transferred from the ROMs — normally drives B: and C: — to the RAMdisk using the CP/M PIP program provided in the utility ROM. PIP itself can be PIPed to RAMdisk to make this easier, and I found it simple to put the contents of two of the four ROMs into RAMdisk and plug the other two into the slots. What combination of ROMs is used is up to you.

Changing ROM cartridges is not the easiest thing in the world, but the carriers mean that it is impossible to get the chips in the wrong way round and it does not cause too many problems. One drawback is that the master reset button is next to the sockets, and can easily be pressed by accident. Epson promises that a plastic cover will be put over the button in every machine shipped.

But even this reset is not entirely disastrous. There are actually three resets in the machine, the master, one that just resets the RAM without clearing down to system level, and one on the RAMdisk box. The RAMdisk even has a write protect switch.

As expected, loading Cardbox Plus via microcassette took an age, but once again this can go into the big RAMdisk and be immediately available. One nice feature of using the cassette is that the directory of drive H: is stored in RAM when the cassette is mounted, and so is instantly available. But loading 30K to or from a cassette is an astonishingly slow process.

The performance of the software is naturally limited by the size of the display, but the packages use the space well. Epson provides software to configure the screen in various ways; there are two virtual screens in memory, and you can switch from one screen to the other by pressing Control with the right or left arrow key. Each screen can also be divided into two 39-column screens with separate contents. All the bundled packages use these features to a greater or lesser extent.



Inside the machine are necessarily densely packed circuit boards containing everything from CP/M to the bundled software. Twenty years ago the circuitry wouldn't have fitted into a room, now it fits in a briefcase.

WordStar is just WordStar, with all the features you would expect. The only limitations that I could find as a long-time WordStar user were the lack of a directory display on call and the dropping of a lot of the help functions. The famous WordStar command menus are still there, but have to be called up separately using the Help function key since each menu completely fills the screen.

The Calc is just like SuperCalc in its commands, and seems to work all right although I am not a spreadsheet connoisseur. The Scheduler is nice, with a diary covering a month from the current date and time and monthly display that shows a chart of all engagements.

Cardbox Plus once again looks like its normal self with a few frills removed, but the commands the same. I found no trouble in using it despite limited experience with the package.

The Basic is standard Microsoft, with the addition of a few commands to do things like change the screen format, and the Utility ROM contains all the standard CP/M programs like STAT, PIP, XSUB and SUBMIT as well as Term, Filink, and the machine configuration program called, not surprisingly, Config.

Config lets you change the disk drive assignments, but it also allows the setting of the automatic power-off timing, the 10 function keys, the date and time, the printer port speed, the size of the RAM disk, the RS232C speed and transmission format, the screen mode, the serial port speed and format, the user BIOS — letting the user configure CP/M — and the keyboard layout and display for various countries. In other words, Config give just about as much flexibility as most users could ever want.

Not having a QX-10, I didn't try Filink. But Term worked fine in transferring WordStar files onto an Osborne running the Microlink comms package, and it was very simple to use. That's more than can be said for Microlink.

All the software is friendly and simple, and uses the facilities of the machine extremely well. Perhaps getting the software right also caused part of the delay in getting the machine out.

Verdict

Epson has reacted well to recent developments in the lapheld computer market, and has come as close to the state of the art as you can get. The choice of CP/M might seem a backward step when Sharp has gone for the 8088 and MSDOS, but there is a lot of life in the 8-bit machine at this level. The provision for standard floppy disks means that the PX-8 can load standard CP/M software, as long as the screen format is not too much of a limitation. And the availability of the big RAMdisk means that real portable computing with big data files is possible without resorting to microcassette. In fact, the PX-8's cassette drive seems a bit irrelevant apart from archival use and for once-and-for-all loading of programs for people without disk drives.

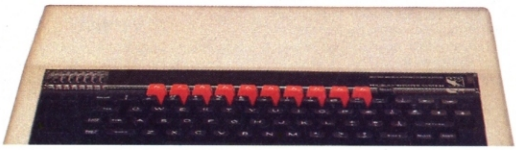
But the most impressive thing about the machine is its flexibility, allowing you to configure everything to suit your needs.

To put it bluntly, I liked it a lot. On this particular computer bandwagon, Epson is back in the driver's seat. PCN

SPECIFICATIONS

Price	Basic model, 64K RAM — £917.70 inc VAT, with extra 120K RAM — £1148 inc VAT
Processor	Z80 CMOS at 2.45MHz
RAM	64K Basic, 60K and 12K RAM packs available
Keyboard	72 full travel keys including cursors and functions. Seven character buffer
Screen	80 x 8 characters, 640 x 64 dots
Storage	Built in microcassette with directory
Operating system	CP/M
Software	Wordstar, Cardbox Plus, Microsoft/Epson Basic, Scheduler and Calc
Interfaces	RS232C, serial, barcode interface, analog input and speaker output
Power supply	Rechargeable NiCd batteries
Manufacturer	Epson (UK) Ltd., Dorland House, 388 High Road, Wembley, Middx., HA9 6UH, 01-902 8892

Unicorn. Five new c
Here's the full



The ZEP 100

- **Z80 Extension Processor**
- **4MHz Z80A**
- **64K RAM**
- **24K ROM**

The object of any upgrade kit is to improve processing ability and to increase data storage capacity. The UNICORN ZEP100 is the first stage upgrade which opens channels into the world of serious computing.

The ZEP100 is the proven 8 bit second processor for the BBC Model B micro. A Z80 extension processor which enables the use of the well established CPN operating system, giving access to the vast range of applications programs and languages available for all CP/M® micros. When fitted to a BBC model B microcomputer with compatible high quality disc drives it provides a complete business or scientific computer which can run large applications programs or use advanced languages, with the ability to switch back to standard BBC programs at any time.

Any ZEP100 can be linked, via the Econet® option on the BBC, to a network of other TORCH computers to provide a workstation running on TORCHNET. Full TORCHNET operating systems software is provided to allow access to information anywhere on the network, or to communicate with other computers.

The 64K ZEP100 is supplied with full software support including word processing, spreadsheet, database and utilities. **The ZEP100 – around £299 (ex. VAT).**

The new UNICORN range from TORCH Computers gives the enthusiast and professional user a choice of upgrades which takes the BBC Model B Micro to the ultimate height of performance.

The result of TORCH'S total commitment to the BBC Micro is the only complete range of high performance hardware available. Offering every BBC Micro owner five new upgrade channels, UNICORN will transform your BBC into a fully communicating workstation, a CP/M® compatible business machine or the ultimate in high powered 32-bit data processing.

At the top of the range, THE UNICORN, offers the power and sophistication of System III UNIX® whilst other channels make available the flexibility of languages such as FORTRAN, PASCAL, BCPL and COBOL. All models, with the exception of the HDP240, provide BBCBASIC(Z80) on the Z80 rather than the Model B's 6502.

Tune in to the Channel that most suits your requirements. Whichever level you choose you can be sure of a system with infinitely expandable potential for a confident future in the world of computing.

hannels for the BBC. programme.

The ZDP 240

- 4MHz Z80A ● 64K RAM
- 24K ROM
- Twin, double sided 400K floppy discs
- Independent integral power supply

The UNICORN ZDP240 (Torch Z80 Disc Pack) is the proven upgrade for the BBC Model B microcomputer. Offering the use of more powerful and flexible languages such as Fortran, Pascal, BCPL and Cobol, it provides 800K of disc storage plus a Z80 second processor with 64K RAM running TORCH's own CP/M® compatible operating system based in ROM.

This advanced design means that almost all of the 64K RAM provided by the Z80 board is available for CP/M® programming use – an advantage no other BBC micro upgrade can offer.

If your BBC micro has the Econet® option, there is a further benefit the ZDP240 can offer. TORCHNET can link together up to 254 upgraded Model B's on a local area network, so for enthusiasts, Clubs and Schools it is a simple and low-cost way to achieve networking facilities.

The discs can be used for storage under the Acorn DFS system or for CP/M® programs and data.

A comprehensive software package is provided with the disc pack. It includes word and data processing and a spreadsheet program, along with utility programs and manuals.

The TORCH Z80 Disc pack is recommended by the CCTA for government use. **The ZDP 240 – around £699 (ex. VAT).**

The HDP 240

- 20Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

For users who need much more storage capacity than is available on floppy discs and who require the large speed gains that a Winchester hard disc provides, the third new channel is now available. The UNICORN HDP240 combines a 400K floppy disc drive with a 20Mb hard disc and its associated controller. The pack connects directly to the disc and 1MHz bus sockets on the BBC Model B.

In conjunction with a ZEP100, it provides a powerful business computer for running CP/M® programs with large amounts of data. The floppy disc can be used for storage with the Acorn DFS system, and both discs can be used by other TORCH systems on the TORCHNET local area network. **The HDP240 – around £1995 (ex. VAT).**

The HDP68K

- 8MHz MC68000 ● 6MHz Z80B
- 256K RAM (68000)
- 64K RAM (Z80)
- 20 Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

The fourth channel in the UNICORN range is for users who need the extra processing power of a 68000 32 bit processor, as well as the Z80 running standard software. The UNICORN HDP68K provides the ultimate in performance, offering an extra 256K RAM and a 68000 processor running at 8 million cycles per second. It also contains a Z80 processor to allow the running of existing TORCH software. **The HDP68K – around £2495 (ex. VAT).**

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Address

Tel Post Code

TORCH COMPUTERS

CP/M is a registered trademark of Digital Research Inc.
Econet is a registered trademark of Acorn Computers Ltd.
Unix is a registered trademark of Bell Telephone Laboratories Inc.

UK version Model B necessary.
Disc interfaces are necessary for use with the Unicorn range.

Text and Graphics provided by BBC Model B.
Keyboard provided by BBC Model B.

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SOFTWARE

WHAT'S NEW WHAT'S NEW WHAT'S NEW

The most interesting release this week was *Flight Simulator 2* for the 64, from Sub-Logic. This has been available in the USA since 1st April and is now on sale over here from Softsel dealers. Flight Simulator 2 probably has more features than any other flight program on a home micro. For example, if you fly over Illinois in Winter, you'll see snow on the ground, while a quick tour of New York should give you glimpses of the Statue of Liberty and the Empire State Building. Expensive perhaps, but worth every penny.

Salamander's latest crop includes games by Jeff Minter,

GAMES

translated from the Vic 20. *Metagalactic Llamas Battle at the Edge of Time* is probably the best-known, 'but what's the point of putting a 3.5K program onto the 48K Spectrum? The translation is a fair one, but compared with some of the good games around, it just doesn't stand up.

Not really a game in the strict sense of the word is *Bridgemaster* from Serin (ex Bridgemaster), is an introduction to expert bridge, and starts where the earlier program of the same name (reviewed in issue 23) left off. it's available for the Spectrum, 64 and BBC/Electron.

On the subject of serious games, there's *Chess* on the Oric or Atmos. This is an upgraded version of Oric Chess and one improvement is what Transoft describes as 'built in voice synthesis' which 'can be difficult to understand at first'. Hmmm. . .

Argus Press Software will launch *Fall of Rome* on May 1st. This is a strategy game based on the last years of the Roman Empire. Available on the Spectrum, BBC, Commodore 64 and Atari, the program has high-resolution graphics and apparently accurate historical detail. Each game gives you twelve moves, each covering five years of history.

The Atari range hasn't seen much new software recently, and even the latest programs from English software are conversions of Commodore 64 programs. *Neptune's Daughters* was reviewed in *PCN* issue 57.

Note to software publishers: If you wish your company's product to be included, please send only the very latest releases to *Bryan Skinner, PCN, Software Editor, 62 Oxford Street, London W1A 2H; and please don't forget to include prices and a telephone number.*

UTILITIES

Forth on the Spectrum has had little attention since Abersoft's version, but now Sigma Technical Press has released its own version, and Alan Winfield's book 'The Complete Forth' (also from Sigma) remains one of the best accounts of using the language. Also on the Spectrum was *L-Forth* from Southfield Software. Forth-79 has been widely used in schools on the RML-380Z and this version has a screen editor and Microdrive support. Two Forth packages in one week is unusual, but this week also saw the release of *CBS-Forth* for the Lynx.

Clare's *Replica II* for the BBC lets you transfer tape files to disk, while *Beta-Base* is a disk database with calculation facilities.

EDUCATION

Richard Shephard is now offering its range of software on the 64 on disk. One of the most important of these is its *Cash Controller*, a home budgeting program. This is available on disk or cassette, the latter at £9.95, and allows up to 400 transactions, sorting, searching, etc. The company has now also transferred *Urban Upstart* to the 64 and this is also available on disk or tape. Also on the 64 we have Romik's *Multisound Synthesiser*.

Another publisher moving into software is Longmans. Some dozen packages were released for the Spectrum, BBC and CBM 64, including 'O' level revision aids for *Maths, Physics, Chemistry* and *Computer Studies*.

Edfax on the BBC comes from Tecmedia, which supplied MEP with Micro Primer packs. It's a teletext simulation package which allows you to create look-alike pages and stores up to 80 of them on a 40-track disk.

ATARI

Neptune's Daughters	£9.95	English Software 061-835 1358
Robin Hood	"	"

BBC

Speed	£13.95	Multisoft 027-588 5895
Spice	£7.95	"
Edfax	£30.00	Tecmedia 0509-230248
Replica II	£26.00	Clares 0606-48511
Beta-Base	£25.00	"

COMMODORE 64

Turtle Jump	£6.99	Romik 0753-71535
Multisound Synthesiser	£14.99	"
Urban Upstart	£6.50	Richard Shepherd 06286-635
Cash Controller	£14.95	"
Flight Simulator 2	£40.00	Sub-Logic (Retail)

DRAGON

Red Meanies	£7.95	Salamander 0273-771942

ORIC/ATMOS

Chess	£9.99	Tansoft 02205-2261
Graffix	£7.99	Windmill 01-049 05371
Classic Racing	£7.95	Salamander 0273-771942

IBM

LSF	£41.34	Prentice Hall

SPECTRUM

Fall of Rome	£6.99	Argus Press 01-437 0626
Bridgemaster	£12.95	Serin 01-369 3180
Multitape	£5.95	Multisoft 027-588 5895
L-Forth	£15.00	Southfield, Oxford 246490
Das Schloss	£9.25	Chalksoft 0905-55192
Psi-Spy	£7.95	Postern 0242-45687/584003
Metagalactic Llamas . . .	£6.95	Salamander 0273-771942
Matrix	£6.95	" "
Forth Compiler	£15.00	Sigma Technical Press 0625-531035
City Fighter	£5.50	Choice Software 09603-69129
Disco Dan	£4.95	Gem Software 0279-723567
3D Hypermaths	£7.95	Longmans 0279-26721
Computer Studies	"	"
Maths	"	"
Physics	"	"

TI99/4A

Forgotten Valley	£6.95	Christine Computing 0923-672941

LYNX

Everest	£7.95	Multisoft 027-588 5895
CBS-Forth	£15.95	Cubsoft 061-792 2871

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SPECTRUM

Be my quest

Name Quest **System** 48K Spectrum **Price** £5.95 **Publisher** Hewson Consultants, Wallington, **Format** Cassette **Language** Basic **Outlets** Mail order, Menzies, Boots, other dealers.

Adventures like this hardly need any introduction, as you know what you're getting before you start: forests, castles, gold, swords, elves and dragons, wizards and rogues.

Objectives

Your task is to search the landscape for an ancient scroll which contains a clue before locating a map. What happens when you find it isn't stated, but pehaps the scroll tells you.

Instructions and hints are clear on the fold-out cassette cover, including a list of about 20 main commands that the program recognises.

In play

You first must choose an identity from the list of wizard, cleric, rogue, fighter and simpleton; the computer distributes points randomly between various features of strength, luck, dexterity, constitution and charm. If any of the first four fall below zero that's the end of you; there are the usual commands to check your status, score and inventory as you go. Get stuck and you type 'Hint,' though the clues are frequently so cryptic as to be more of a hindrance.

This is not a text-only adventure — some locations come with graphics, but they tend towards the simple rather than *The Hobbit* standard, and the quality of text is uninspired.

Although the adventure began to absorb me as I wandered around mapping out the locations and encountering the dwarves and elves, not to mention the golem who has strayed in from elsewhere, some responses were odd. They seem to indicate the program hadn't fully allowed for a wide enough variety of instructions. In one place I was told 'You can see: a gold piece; a short sword; a bread.' While uncertain what 'a bread' was, I decided to try and nibble it anyway: 'Eat bread.' 'What bread?' came the reply. 'Get gold,' I tried. 'That's meaningless!' I was charmingly informed 'Get gold piece' was obviously what was wanted, and only after getting that and the sword was I allowed to eat the bread . . . perhaps it was an unsliced loaf.

Other features include a range of 12 possible magic spells and combat with various characters.

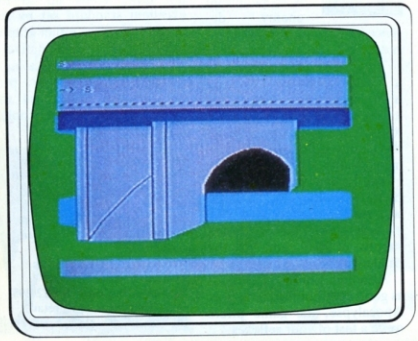
Verdict

With *The Hobbit* and *Valhalla* setting the standard, (even though three times the normal price), average adventures like this begin to pale by comparison. It takes a *Mad Martha* or a *Groucho* to stand out from the crowd.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



Android angst

Name Last Sunset For Lattica **System** 48K Spectrum **Price** £5.50 **Publisher** Arcade, 32 Chislehurst Road, Orpington, Kent **Format** Cassette **Language** Basic/Machine code **Outlets** Retail/mail order.

As long as *Berserk's* many emulators are as good as this new one, which owes something to *Tutankhamen* and *Halls of the Things* I won't complain.

Objectives

You must find and defuse a bomb that's somewhere in the 100 locations in the game's mazes, which are on three different levels. To go from one level to the next you first find a key, then the lock to fit it.

In play

The maze is a *Tutankhamen*-like arrangement of long passages with deadly walls, occasionally leading into large chambers where you tend to find the goodies, along with a few million baddies. (600 to be precise). The baddies are of five types of Android, and the graphics for these are very good. You're shown the whole list of them before the game begins, dancing to a tapping sound — the Cycloids seem to be doing a soft-shoe shuffle.

Your own character also seems to enjoy a knees-up. As well as the key and lock you're also shown the bottles of magic potion which gain you an extra life on touching them. The Androids fire at you, but you can pass through them without harm which is just as well considering the narrowness of the passages. A good tactic seemed to be to ignore the aliens completely and make a mad dash through the passages to find the key and lock, trusting in luck that you wouldn't get hit on the way, then return to see off as many Androids as possible.

Four different skill levels from expert to novice affect the speed and I found the novice level tough enough. The advice on negotiating the maze is 'If in doubt, turn right.' I managed to get through to the second level, which was the same as the first only more heavily populated.

The screen scrolls automatically, which is fine if you're on a passage but a problem in the chambers as you're not shown the exits. If you try to go out of a chamber at the wrong point you're shown the next screen and must the re-aim for a passage entrance.

As if negotiating the passages, finding keys and locks and annihilating Androids isn't enough, the bomb you're defusing (remember the bomb?) is on a timer which starts at 150 and ticks steadily away at the foot of the screen. There's also a high-score record which looks rather odd as the programmer has elected to use the letter 'S' wherever a '5' is needed.

Verdict

Not quite in the top class of *Halls of the Things*, but still a good, fast, colourful game.

Mike Gerrard

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	

A batch of Atari allsorts are tasted by Bob Chappell — which are his favourite ones?

An Atari assortment

A mixed bag of subject matter this time, including solving a murder most foul on an airship, driving a racing car and piloting a jetcopter, but there's not a bad egg among this collection.

MURDER ON THE ZINDERNEUF

A most intriguing and unusual game. You play the part of any one of six oddly familiar sleuths — do the names Achille Merlot, Emile Klutzeau and Miss Agatha Marbles ring any bells?

It is the year 1936 and on board the luxurious dirigible Zinderneuf one of the 16 passengers has been murdered. Roaming freely around the passenger area you must search rooms and interrogate the remaining 15 travellers to discover whodunnit. The Zinderneuf's layout and all the characters are shown graphically, movement of your gumshoe being controlled by joystick or keyboard.

All commands are entered via menus which appear at the top of the screen. You can question individual suspects using different approaches, appearing as thick as two short planks one minute and, if you want, being downright violent the next. You may ask any suspect about any other suspect, ignore them altogether or accuse them. The responses you get are determined by who, how and what you ask.

You have only 12 hours (approx 36 minutes of actual play) to solve the crime, a bell chiming at every game hour.

An excellent and novel game, and not so elementary, my dear Watson — it's different every time you play so there's plenty of life and entertainment in it.

PIT STOP

If racing's your game, you'll like this one. Not only do you have to drive your car in the big race, you also control the pit stops.

Steve Wright

You get the usual bird's-eye view of the track, which scrolls smoothly and rapidly away, from top to bottom, as you race. Hit another car on the edge of the track and you just bounce off — but you do incur damage. As a tyre receives ill-treatment, it gradually changes from dark to light blue to red, indicating its deterioration.

A small map of the course is on view, a marker denoting your position and that of the pits. When you reach the pits, you merely have to pull over into the slip lane whereupon the scene changes to show your car at rest in the bay. Around the car is your pit crew, four mechanics, each with a special function. A mechanic is activated by moving a tiny cross onto it, pressing the fire button then pulling the character around the screen. You use the mechanic to change your tyres and refuel.

Time is not on your side — other cars are roaring past the pits while you remain. Moving the cross onto the flagman lets you back on the track again.

There are a number of skill levels, laps and different circuits to choose from. The graphics and sound are first rate, producing a thoroughly enjoyable motor racing simulation.

BLUE THUNDER

Blue Thunder is a jetcopter whose mission is to penetrate enemy defences to rescue captive comrades.

There are electronic storms, a variety of missiles and armoured barrage balloons to keep a weather eye out for. You must shoot your way through the enemy's defensive screens in order to reach the captives.

The screen scrolls left and right, revealing a total of about six screens of landscape. Several skill levels and a limited supply of fuel add to the challenge.

Although similar to, but not as good as, Choplifter and Fort Apocalypse, the game offers quite a test of your reflexes.

MISSILE COMMAND

An Atari original and, for my money, still one of the most addictive shoot-em-down games around.

In case you've not heard of it, the game places you as the sole defender of six cities against an ever increasing deluge of alien missiles which streak down from the skies. A cross-sight is used to plant target points across the screen for your own missiles to head for. The idea is to detonate your missiles in the path of the descending warheads.

Colourful, exciting and challenging, this is one game I can simply never tear myself away from. Not one any committed hero can afford to be without.

SHAMUS II

The little fedora-hatted character (called Shamus, naturally) features in this sequel. He is still rushing around a labyrinth of cutaway chambers which this time are inhabited by snakes, octopuses, and other odd creatures. As in the original, the arch-fiend the Shadow is still lurking about the place.

There are keys, prizes and messages to be collected throughout the building.

Like most sequels, this does not quite come up to the excellent standard set by the original Shamus, either graphically or imaginatively. Nonetheless, it is still a high-quality, professionally produced game which will undoubtedly give a lot of people a great deal of pleasure.

Blue Thunder, £9.95, Cassette, Richard Wilcox Software, Station Road, Walsall WS7 0JY, mail order/retail
Missile Command, £28.95, Disk, Atarisoft (Slough 33344) mail order/retail
Shamus II, £24.95, Cass/disk, Synapse Software, retail
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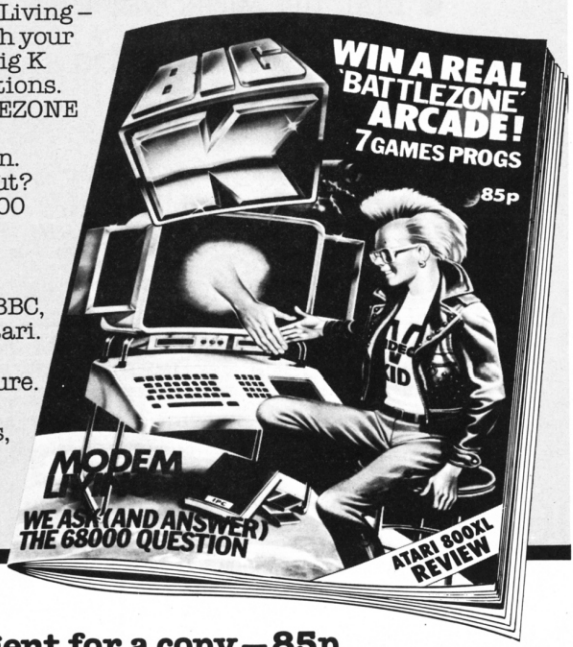
- Win a full-sized BATTLEZONE arcade game in Big K's extravagant competition.
- What's all the fuss about? Big K examines the 68000 wonderchip.
- Atari 800XL review.
- 7 games programs for Commodore 64, Vic 20, BBC, Spectrum, ZX81, Oric, Atari.
- Atari graphics – read Big K's special feature.

Plus – Arcade Alley, dozens of games reviews, expert technical features, lots of fun and lashings of colour.



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Good, bad and mediocre — a 64 compendium rated by Nick Rann.

Commodore collection

FIRE ANT

Not the game for anti-monarchist Willie Hamilton. Our intrepid anti-hero must scuttle through eight Scorpion-infested chambers to rescue his imprisoned Queen. To succeed you must plan a campaign to sneak past ever vigilant Scorpion patrols who guard the sacred wench, tails-a-quiver.

Within these pestilent walls lies a trail of mysterious objects. Piece together their significance and you could be off down the secret passage to anthills anew and a plateful of Kentucky fried larvae. Lose your way and it's a quick jab to the antrum, loss of life and raw eggs for a fortnight.

Worse still, should you reach the last chamber, Her Majesty is not amused and hastily despatches you to rescue her Maiden Aunt. A likely story, but this joystick-only game will have all six feet stomping in frustration as your brilliant strategy is thwarted time and again by the persistent Scorpions.

Fire Ant is compulsive and enduring entertainment, combining high-quality graphics with a thoughtfully constructed plot. Don't show your friends — you'll never get another go.

ZODIAC

This time it's your turn to chase the Scorpion — plus the eleven other signs of the Zodiac. There you are in the vaults of Time, not knowing whether you're Russell Grant or Dr Who, expected to perform a fabulous mission to recover the missing Zodiac signs.

Inching menacingly towards you as they multiply are the signs' fiendish captors — Jufo, Jukol and the scissor-like Jessor. One touch from any will lose you a life, as will collision with the electrified perimeters of the inky corridors. Your only weapon is a rapid-fire time-laser, rendered impotent if you dare to dally. So, throwing subtlety to the wind, it's the Astrology Yearbook placed firmly on the joystick fire-button and heads down.

The first few passages are easily cleared of aliens, collecting a couple of signs as you go. Thereafter the going gets decidedly tricky. The demons appear in endless swarms and a frenzied burst of manic laser bolts precedes almost inevitable destruction. If you manage to return all twelve signs to the Time Vaults the angry masters will dispossess you and scatter your treasures in the domain of Jemon — your fiercest adversary.

From the turbo-load to the last of the Jukol, *Zodiac* is a fast game with few frills, designed for addicts of non-stop arcade-style action. I found it hard to sustain interest in the meagre plot but taken with sharp sound and crisp graphics Zodiac will certainly have you seeing stars.

DINKY DOO

Just when you thought it was safe to go back to bed — along comes Dinky Doo with his light-hearted spoof on spooks. Cheese butties before bobos have given little Dinky Doo nightmares. Hot milk is the answer but a ghoul-ridden subconscious voyage lies between Dinky and his plastic beaker. Using keyboard or joystick, you must guide our hapless chum around electrified walls, slippery snakes, skulls and the other mobile horrors which haunt the murky recesses of his dream.

Upon reaching the hot milk, these nocturnal apparitions become benevolent cherries which, when eaten, boost your score. Next, hoping to find Mum, Dinky hotfoots it through the door, only to find he's still dreaming and the second of fifteen increasingly difficult ghost walks awaits.

Smooth graphics and interesting visual displays, combined with eerie sound effects and a smattering of good humour make for some amusing fun in this Merseyside sleep drama. The Beatles' *When I'm 64* is the opening theme tune — but you'll need to be wide awake if Dinky is to make it past six.

ZYLOGON

Meanwhile, back in hyperspace, Big G promises three-dimensional joystick action with isometric projection in this cosmic quibble. Just for the hell of it (or to save mankind, if you prefer) you must annihilate the Zylogons.

In the first of two stages, your craft zig-zags around the Zylos' Lego fortresses, keeping an eye out for sporadic missiles. The missiles approach in pairs, and launching retaliatory bombs on a three dimensional trajectory requires accurate judgement of height and range.

Unfortunately, the axis on which your ship manoeuvres combined with patchy graphics impair the 3D effect. However, I found the juddering motion of the byte-wide diagonal scroll induced exactly the kind of psychosis needed to combat the awesome droids anticipated in stage two.

No such luck — the polymorphic Zylogons who resemble anything from a gas lamp to a baby grand, attack diagonally in wave formation only occasionally breaking rank to avoid systematic destruction from your twin lasers. In fact, the biggest headache of lower skill levels is diminishing fuel supply.

Indifferent production mars this otherwise palatable game which attempts to expand the traditional invaders theme.

ODYSSEY

Homer would have choked on a kebab. More of an oddity than an Odyssey, the title belies what is basically an anthology of 'Micro-Greats' from K-Tel.

In the first of five vaguely related screens, I found myself in well-charted Invader territory, going hell for leather on the joystick at hordes of Plague Pests shuffling smartly across the horizon. At the ninth attempt I reached 2,000 points and progressed to ensuing shooting matches with an egg, a Robo-crab and various alien ships — sounds familiar?

Snappy graphics and a professional presentation enhance the fast machine code action which certainly makes Odyssey a bit of a tough nut even for seasoned campaigners. Challenging or tedious — you'll have to decide, but strategy it lacks; original it isn't and an Odyssey . . . never.

Fire Ant (£7.95) Mogul 01-947 4454
Zodiac (£7.95) Anirog 0322 92513
Dinky Doo (£7.95)Software Projects 051 428 7990
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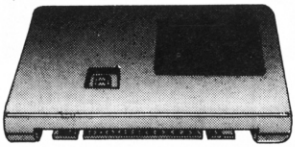

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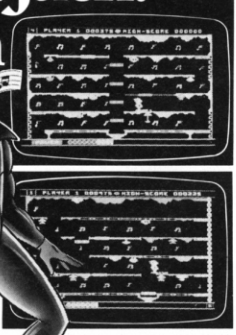

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This program from Mr T P Hutt of Guildford allows functions to be plotted in three dimensions on the BBC's graphics screen (MODE 4).

Three variables are available to the user to help define the height of a given point. These are:

X — the X coordinate of the point ranging from zero at the left of the screen to twenty at the right.

Y — the Y coordinates of the point ranging from zero at the back to twenty at the front.

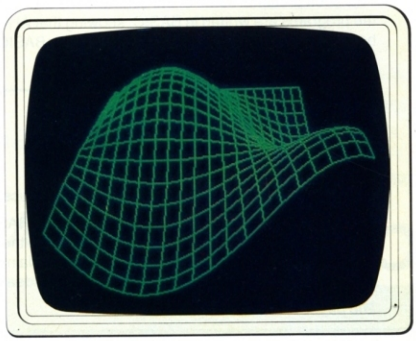
R — the distance of the point from the centre of the plane, as defined in Pythagoras' theorem.

The maximum values of X and Y are set up at the start of the programs as NX and NY. When entering equations, it helps estimate where the graph will appear on the screen as sometimes, especially where large numbers are involved, it tends to be off to one side or off the screen entirely.

The escape key can be used to abort the plot and reset to the equation if all is not going well, allowing the equation to be changed using the cursor keys.

Altering the values given to RANGE and ELEV change the distance and height of the viewpoint respectively. ZMAG alters the magnification of the z axis, XOFF causes the plane to appear to be viewed along the line X=XOFF, increasing XOFF moves the plane to the right, decreasing moves it to the left. The author suggests that only NX, NY, ELEV or range be modified as other values will automatically be changed to suit.

GRAPH 3D



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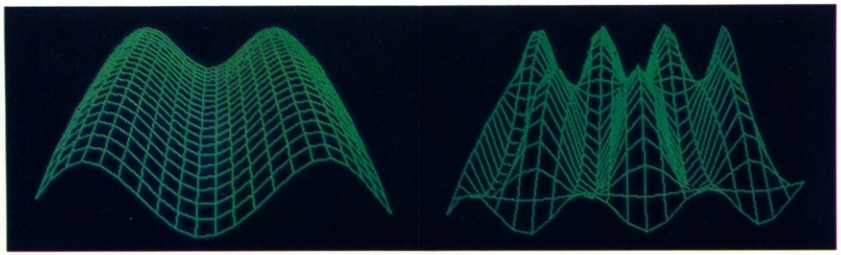
Remember, though, it must be your own work, not previously published elsewhere.

Title: ***Graph-3D***
Machine: ***BBC A/B Electron***
Language: ***BBC Basic***
Application: ***Graphics***
Author: ***T P Hutt.***

10	Set up the number of squares for X and Y axes.
20	Set up magnification parameters.
30	Set up view point.
40	Mode 4 graphics. Note the program can be run in mode 0 if NX and NY are reduced.
50	Foreground green.
60/70	Set up the arrays.
80-140	Initialisation of the screen coordinates when Z=0. Calculation of R for each point. This is only executed once in order to save time.

```
 10 NX=20:NY=20
 20 XMAG=25000/NX:YMAG=50000/NY:ZMAG
    =20000/NX
 30 ELAV=15:RANGE=20:XOFF=NX/2:
 EQ$=""
 40 MODE4
 50 VDU19,1,2,0,0,0
 60 DIM Y%(NX,NY),X%(NX,NY),Y%(NX,NY)
 70 DIM R(NX,NY)
 80 FOR I=0 TO NX
 90 FOR J=0 TO NY
100 X%(I,J)=FNX(I,J)
110 Y%(I,J)=FNY(I,J)
120 R(I,J)=SQR((I-NX/2)^2+(J-NY/2)^2)
130 NEXT
140 NEXT
```



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Artificial Intelligence in BASIC

Mike James

Artificial intelligence is an aspect of current computing attracting great interest. Until now there have been few practical pointers to enable enthusiasts to get to grips with the subject.

This book presents some of the central ideas of AI complete with programs to illustrate the methods. All of the programs are written in BASIC, showing that AI is not beyond the scope of the personal computer. If you have a personal computer and can program in BASIC this is the book for you.

192 pages *£7.50*

LISP for Micros

Steve Oakey

LISP is important in artificial intelligence and robotics.

Assuming that you can already program in either BASIC or Pascal, this book starts you off with simple examples, gradually developing your expertise to the point where you can understand and use the advanced facilities of LISP. It introduces and explains programming in LISP using normal iterative methods, recursion and LISP interpreter. Finally, the book deals with program design and development in LISP.

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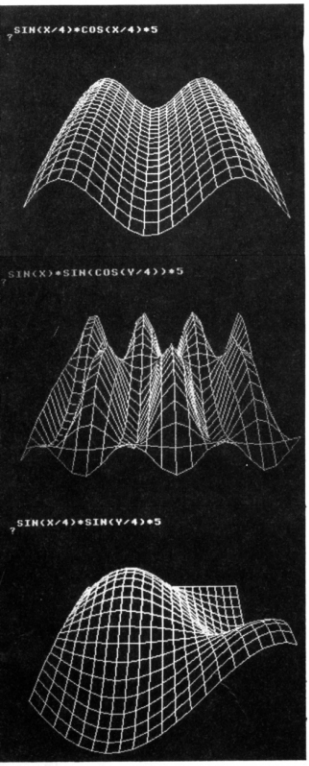
GRAPH 3D

150 End of initialisation.
160-200 Acceptance of the function required. This must be a function of X, Y and R only.
210-260 Calculate the screen coordinates for the function supplied. Note that X does not change and that the vertical offset only is calculated and added to the default Y coordinates.
270-450 Draw the function. 340-370 hidden line algorithm. 380-420 Drawing grid.
470-490 Functions for conversion from cartesian to perspective coordinates.
500-590 Error handling procedures.




```
150VDU 7
160 ON ERROR GOTO 500
170 VDU 23;8202;0;0;0;0
180 PRINTTAB(1,1) EQ$:INPUT LINE Z$
190 IF Z$<>"" EQ$=Z$
200 CLS
210 FOR X=0 TO NX
220 FOR Y=0 TO NY
230 R=R(X,Y)
240 Y1%(X,Y)=Y%(X,Y)+FNY1(X,Y)
250 NEXT
260 NEXT
270 FOR Y=0 TO NY
280 FOR I=0 TO 1
290 XS=0:XF=XOFF:DX=1
300 IF I=1 XS=NX:XF=XOFF+1:DX=-1
310 FOR X=XS TO XF STEP DX
320 IF X=XOFF THEN 400
330 IF Y=NY THEN 380
340 MOVE X%(X,Y)+4*DX,Y1%(X,Y)
350 MOVE X%(X+DX,Y)-4*DX,Y1%(X+DX,Y)
360 PLOT 87,X%(X,Y+1)+4*DX,Y1%(X,Y+1)
370 PLOT 87,X%(X+DX,Y+1)-4*DX,Y1%(X+DX
    ,Y+1)
380 MOVE X%(X,Y),Y1%(X,Y)
390 DRAW X%(X+DX,Y),Y1%(X+DX,Y)
400 IF Y=NY THEN 430
410 MOVE X%(X,Y),Y1%(X,Y)
420 DRAW X%(X,Y+1),Y1%(X,Y+1)
430 NEXT
440 NEXT
450 NEXT
460 GOTO 160
470 DEFFNX(X,Y)=640-XMAG*ATN((XOFF-X)/
    (NY-Y+RANGE))
480 DEFFNY(X,Y)=1023-YMAG*(1-ATN(PI/2-
    (ELAV/(NY-Y+RANGE))))
490 DEFFNY1(X,Y)=ZMAG*ATN(EVAL(EQ$)/(N
    Y-Y+RANGE))
500 IF ERR=17 THEN 560
510 COLOUR 0:COLOUR 129
520 PRINTTAB(0,3);
530 REPORT
540 COLOUR 1:COLOUR 128
550 GOTO 160
560 PRINT "ABORT (Y/N) "
570 A$=GET$
580 IF A$="Y" THEN END
590 CLS:GOTO 160
```

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ORIC RENUMBER

Title: *Oric Renumber* **Machine:** *Oric-1 48/16K* **Language:** *Basic* **Application:** *Utility* **Author:** *G J Harbach*

63010-63040 set up variables
63060-63100 Set up array
63120-63180 Fill the array from Basic pointers
63200-63250 Get start line and check whether it exists
63260-63310 Get end line and check it.
63320-63550 Get step length
63370-63410 Reset the array
63430-63560 Go through and look for the relevant tokens
63590-63690 Having found the token then fine the appropriate line number
63710-63770 Find new line number
63790-63860 Replace the new line number

The following utility, from Geoff Harbach of Solihull, is a renumber routine for the Oric-1 and possibly the Atmos. It will renumber all GOTOS, GOSUBS, ON-GOTO/GOSUBS, THENS and ELSES. It cannot cope with computed GOTOS, i.e. GOTO A or GOTO A*10, and may even corrupt the latter.

If '0' is entered at the first prompt, the routine will start from the beginning of the program. Note that the program to be renumbered must work for proper results.

```
63010 CLS:PRINT:PRINT"Renum Running"
63020 SA=DEEK(#9A) '(=1281 on ORIC 1)
63030 A=SA:B=0:C=0:D=0:E=0:F=0:FL=0:
    FP=0:L=0:LL=0:N=0:NN=0
63040 N$="":NU$="":P=0:P$="":R=0:SP=0:
    SW=0:X=0
63050 REM          Dim array
63060 REPEAT
63070 N=N+1
63080 A=DEEK(A)
63090 UNTIL DEEK(A+2)=63000
63100 DIM M(N,3)
63110 REM          Fill array
63120 A=SA
63130 FOR R=1 TO N
63140 E=DEEK(A+2)
63150 M(R,1)= E: M(R,3)= E
63160 M(R,2)=A+2
63170 A=DEEK(A)
63180 NEXT R :PRINT
63190 REM  Collect line No parameters
63200 INPUT"From line No ";FL:PRINT
63210 IF FL>62999 THEN 63200
63220 IF FL<=0THEN A=SA :GOTO 63260
63230 FOR R=1TO N:IF M(R,1)=FL THENB=1
    :SP=R:R=N
63240 NEXTR:IFB=1THENB=0:GOTO 63260
63250 PRINT"No such line No !":WAIT200
    :GOTO 63200
63260 INPUT"To line No    ";LL:PRINT
63270 IF LL<=FL THEN 63260
63280 IF LL>63999 THEN 63260
63290 FOR R=1TO N:IF M(R,1)=LL THENB=1
    :FP=R:R=N
63300 NEXTR:IFB=1THENB=0:GOTO 63320
63310 PRINT"No such line No !":WAIT200
    :PRINT:GOTO 63260
63320 INPUT"Step width    ";SW:PRINT
63330 SW= INT(SW)
63340 IF SW<1 THEN 63320
63350 IF SW>1000 THEN 63320
63360 REM          Renum array
63370 NN=FL
63380 FOR R=SP TO FP
63390 M(R,3)=NN :DOKE M(R,2),M(R,3)
63400 NN=NN+SW
63410 NEXT R
63420 REM      Main loop
63430 A=SA
63440 REPEAT :PRINT:PRINT DEEK(A+2),
63450 FOR D=A+4 TO DEEK(A)
63460 IF PEEK(D)= 151 THEN 63510
63470 IF PEEK(D)= 155 THEN 63510
63480 IF PEEK(D)= 200 THEN 63510
63490 IF PEEK(D)= 201 THEN 63510
63500 GOTO 63540
63510 D=D+1:IF PEEK(D)=32 THEN 63510
63520 IF PEEK(D)>47 ANDPEEK(D)<58 THEN
    63590
63530 GOTO 63460
63540 NEXT D
63550 A=DEEK(A)
63560 UNTIL DEEK(A+2) > M(N,3)
63570 PRINT:PRINT:PRINT"END":END
63580 REM  Key word found,find number
63590 F=D
63600 FOR X=1 TO 5
63610 IF PEEK(D)<48 OR PEEK(D)>57 THEN
    63630
63620 GOTO 63660
63630 IF PEEK(D)=32 THEN 63660
63640 IF PEEK(D)=44 THEN C=1
63650 X=5:GOTO 63690
63660 N$= CHR$(PEEK(D))
63670 NU$=NU$+N$
63680 D=D+1
63690 NEXT X
63700 REM          Find new line number
63710 L=LEN(NU$)
63720 P=VAL(NU$)
63730 FOR R=1TO N
63740 IF P = M(R,1) THEN P=M(R,3):R=N:
    PRINT P;
63750 NEXT R
63760 P$=STR$(P):IF ASC(P$)=2 THEN
    P$=RIGHT$(P$,LEN(P$)-1)
63770 IF LEN(P$)>L THENPRINT"To Long "
    ;:GOTO 63850

63780 REM      Replace new line number
63790 FOR R=1 TO L
63800 POKE F-1+R,32
63810 NEXT R
63820 FOR R=1 TO LEN(P$)
63830 POKE F-1+R,ASC(MID$(P$,R,1))
63840 NEXT R
63850 IFC=1 THEN C=0:NU$="":GOTO63510
63860 NU$="":GOTO 63460
```

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MACHINE CODE UTILITIES

This week's utility is for the Commodore 64, sent in by James Marsden from Eastbourne. Each of the four routines is fully relocatable and completely independent. To relocate a routine simply change the variable 'S', situated before the relevant data statements, to point to the new location. To use one on its own, simply type in the DATA statements for the routine and the loader on lines 690-730, not forgetting the start address 'S', then run the routine from the point where 'S' is defined.

When entering the utilities, all REM statements can be omitted as their only function is to explain how to use the routines. To save the routines, use the 'memory save': SYS 49248,49152, (01 for tape) (08 for disk).

Title: Machine code utilities
Machine: ***Commodore 64***
Language: ***6510 Machine code***
Application: ***Various***
Author: ***James Marsden***

```
90 REM SIMULATED DOKE - 2 BYTE POKE
100 REM STORED LO/HI
110 REM FORMAT :
120 REM   SYS49152,ADDRESS,NUMBER
130 REM NUMBER = 0 TO 65535
140 S=49152
150 GOSUB690
160 DATA32,253,174,32,138,173,32,247,183,174,20,0,172,21,0,142,251
170 DATA0,140,252,0,32,253,174,32,138,173,32,247,183,174,20,0,172
180 DATA21,0,142,253,0,140,254,0,160,0,173,253,0,145,251,200,173
190 DATA254,0,145,251,96,-1
200 REM
210 REM ***************************
220 REM
230 REM SIMULATED GOTO
240 REM AS SPECTRUM,THIS LETS YOU JUMP TO A LINE NUMBER BY A VARIABLE
250 REM FORMAT :
260 REM   SYS49208,VARIABLE
270 REM VARIABLE CAN BE ANY FORMULEA EG '21*X' OR '30*7+R' OR 'K' ETC..
280 S=49208
290 GOSUB690
300 DATA32,253,174,32,138,173,32,247,183,76,166,168,-1
310 REM
320 REM ***************************
330 REM
340 REM SIMULATED PRINT AT
350 REM FORMAT :
360 REM   SYS49220,X,Y,[MESSAGE]
370 REM X= X CORD (0-39)
380 REM Y= Y CORD (0-24)
390 REM MESSAGE - TREAT AS NORMAL PRINT STATEMENT
400 S=49220
410 GOSUB690
420 DATA32,253,174,32,158,183,138,72,32,253,174,32,158,183,138,160,104
430 DATA170,24,32,240,255,32,253,174,76,160,170,-1
440 REM
450 REM ***************************
460 REM
470 REM SAVE AREA OF MEMORY
480 REM FORMAT :
490 REM   SYS49248,START,FINISH,DEVICE
500 REM START = START ADDRESS OF MEMORY TO SAVE
510 REM FINISH= FINISH ADDRESS +1 OF MEMORY AREA
520 REM DEVICE = 01 CASSETTE
530 REM        = 08 DISK
540 REM *TYPE LEAD ZERO (0)
550 S=49248
560 GOSUB690
570 DATA32,253,174,32,138,173,32,247,183,174,20,0,172,21,0,142,172
580 DATA0,142,193,0,140,173,0,140,194,0,32,253,174,32,138,173,32
590 DATA247,183,174,20,0,172,21,0,142,174,0,140,175,0,162,0,142
600 DATA183,0,232,142,185,0,32,253,174,32,155,183,142,186,0,76,237,245,-1
610 REM
620 REM*********************************
630 REM
640 REM ALL ROUTINES ARE FULLY RELOCATABLE
650 REM TO MOVE THEM CHANGE VARIABLE S BEFORE THE GOSUB
660 REM MAKE SURE THE ROUTINES DO NOT OVER LAP
670 REM
680 REM ALL 'REM' STATEMENTS CAN BE OMITTED
685 END
690 READA
700 IFA=-1THENRETURN
710 POKES,A
720 S=S+1
730 GOTO690
```

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Next, we thought we would give the Dragon some sprites. We required multi-coloured sprites of any reasonable size or shape and we wanted to be able to move them without obliterating whatever else might be on the screen. We quite fancied being able to control sprites from the keyboard or joystick with just a single command, and we thought it would be nice to be able to fire sprites with the joystick buttons. No sprite system worth its salt would ignore collisions, we thought, so we would have to have a collision detection as well. Also, we wanted the sprites to be fast, versatile and easy to use, with lots of functions so that the control programme would know where all the sprites were, and what they were doing. Another brainwave was to include an automatic maze running feature where all the sprites chase, (or run away from) a particular sprite, so that it would be easy to write THAT kind of programme. Then we thought we would like to have easy animation, preferably looked after automatically, by the sprite handling system. Finally, just to make the whole idea totally impractical, it would have to be driven entirely from Basic, without any tedious Peeking and Poking.

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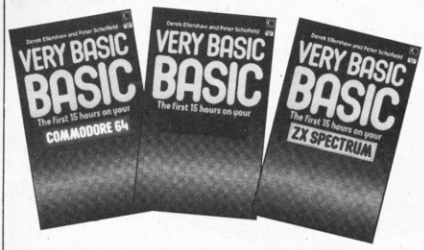


'Very Basic Basic' for Spectrum, Commodore 64 and Electron by Derek Ellershaw and Peter Schofield, published by Century Publishing with Melbourne House at £2.95 each (paperbacks, 113-119 pages).

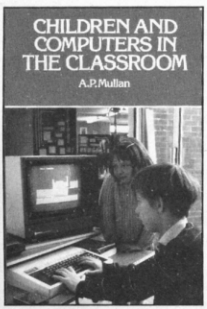
These books are handy if you find the manual for your machine — Spectrum, Electron, or Commodore 64 — hard to understand because Derek Ellershaw and Peter Schofield carefully lay the foundations for you to build up your programming skills.

The authors don't profess to cover every aspect of how to use your machine, but by touching the tip of the iceberg should entice you to explore further.

Each book explains the keyboard, commands, looping, branching, variables and so on. There's good advice on add-ons and how to use your micro for practical applications.

They begin by telling you what you need to know before you start programming, then you move on to the bare bones of programming techniques, followed by hints on using a tape recorder and printer and more programming details.

SG



'Children and Computers in the Classroom' by Antony Mullan, published by Castle House Publications at £6.95 (paperback, 157 pages).

'Databases in the Classroom' by Derrick Daines, published by Castle House Publications at £6.95 (paperback, 116 pages).

These are timely books; every week sees more educational software, yet little is available to tell teachers or parents how to use or judge it.

'Children and Computers in the Classroom' begins with an introduction to computing. The second chapter tackles the role of the computer in the classroom, concluding that the micro is fundamentally different from any other teaching aid. Mr Mullan believes it has the potential for contributing to an enhanced creative environment, particularly in maths and science.

The fact that few schools have enough micros to realise that potential is considered and organisational solutions are suggested.

Chapter three looks at software. Mr Mullan divides educational programs into three areas: courses of study, drill and simulation. Drill programs are described briefly, then discussed from a theoretical standpoint. Curiously, no examples of contemporary British programs are given.

The chapter called the Teacher as Programmer will only be of value to those new to programming — it details the design of a simple educational program. Other chapters include the Child as Programmer, a Possible Methodology (Turtles and Logo) and the Computer and the Curriculum.

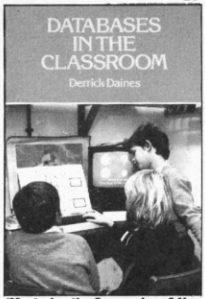
I found the book a fair introduction to the subject, but the roundabout style and lack of contemporary reference made me look to see if this was a 1970s reprint.

'Databases in the Classroom' begins by justifying itself with a history of record-keeping. It goes on to describe data management in terms of input, storage, retrieval, and so on. The third chapter, Computer Skills, (among others) would be good introductory material for Computer Studies at 'O' or CSE level. Chapter five gives useful practical applications of database usage in the classroom.

The next three chapters detail tape and disk storage and include technical explanations of disk accessing. The book gives detailed listings of a database for the BBC Micro with annotation for those with some programming knowledge.

Both these books show there is exciting work going on in schools. However, they are self-indulgent in places, rather formally presented and on the thin side, giving an overall impression of a lack of depth.

BS



'Mastering the Commodore 64' by AJ Jones and GJ Carpenter, published by Ellis Horwood at £6.95 (paperback, 383 pages).

Mastering the Vic 20 from the same publisher and co-authored by Antonia Jones is without doubt the best book on the Vic 20 available, so this version for the 64 has a strong pedigree. Unfortunately, it doesn't reach quite the pinnacle of the earlier title — this one is merely excellent.

After the flood of books aimed at the novice owner of the 64, it is a welcome change to have one for the more advanced programmer. Although the usual review of Basic is included, I suspect it is here more for thoroughness than to meet any need of the reader. The assumption appears to be that you'll know basic Basic and now want to develop your skills.

For the most part the tone is brisk and businesslike (the occasional attempts at levity strike an odd note) with thorough explanations and many example programs, both practical and entertaining.

Every aspect of programming the 64 is covered: an in-depth look at manipulating arrays, all of the graphics modes, Input/Output routines, and a really informative section on how the Basic interpreter works and the ways in which you can use this knowledge.

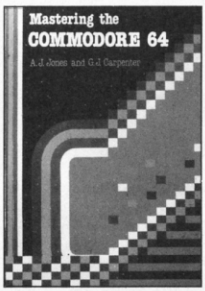
If there is a weak spot it is the chapter on sound which comes dangerously close to being over-technical and has too few examples. It is salvaged, however, by a synthesiser program of near-commercial standard.

Having dissected Basic so thoroughly the authors move on to machine code programming and while it does not attempt to teach you assembler, once you have begun to program in machine language this book more than any other will help you get the most from the combination of language and machine.

The outstanding feature of the book is the standard of programs (available on tape or disk from distributor John Wiley). They include a sprite editor, Basic and machine code high-resolution plotting programs, countless utilities and a splendid Gin Rummy game which pits you against the 64. The machine code programs are presented in annotated source code and in Basic loader form to further help you learn assembler.

A book that lives up to its title and the first to buy if you consider yourself beyond the beginner stage.

PW



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It hasn't taken long for book publishers to catch on to the potential market for glossy publications about the IBM PC.

'The IBM Made Easy' by Leo Scanlon, published by Prentice-Hall at £14.35 (paperback, 125 pages).

'The IBM PC Made Easy' is a good introduction to using the machine. It's along the lines of a home micro book and seems grossly overpriced at £15. But it's friendly, tells you how to use the DOS commands and introduces Basic quite well. However, it's thin on technical detail and probably too introductory for most PC users.

'Animation, Games, and Sound for the IBM PC' by Tony Fabbri, published by Prentice-Hall at £14.40 (paperback, 189 pages).

'Animation, Games and Sound' is aimed at the newcomer to Basic. It starts with PRINT and goes on to diagonal motion with shadows, for example. There are plenty of sample programs and the explanations are lucid. The listings are clear but there's little in the way of technique or structure. The games given are a bit simple and the graphics limited. Sound gets only one of the 23 chapters; and while Lance Leventhal may have called it 'The best personal computing book I have ever seen', I certainly wouldn't.

'Computer Graphics for the IBM Personal Computer' by Donald Hearn and M Pauline Baker, published by Prentice-Hall at £16.10 (paperback, 329 pages).

'Computer Graphics', on the other hand, is very good indeed. After a brief introduction to the machine and its display, it launches into character pictures and soon goes on to pixels and graphs. The latter part of the book really takes off with scaling and transformation of images as well as animation, windows and 3D perspective.

The beginner may find some of the theory hard to follow, but for anyone who's progressed beyond the basics in Basic, this is a treasure. Even if you don't have an IBM, you could get this book and adapt the routines for yourself.

'Best Business Software for the IBM PC' by Richard Dorf, published by Addison-Wesley at £10.95 (paperback, 205 pages).

This 200-page volume starts with a brief introduction to the history of micros before going on to describe floppy disks and it's not till chapter five that you get an intro to software.

The sixth chapter tackles word processors, starting with a brief and out-of-place history of printing before describing what a good word processor should give you and mentioning 15 programs briefly. And this is one of the longer chapters.

Each program is summarised and there may, or may not be, a more or less useless table of ratings, plus comments.

Most important areas of applications software are covered, but you'd be better off with a good software directory or a PC magazine.

'Games, Graphics and Sound for the IBM PC' by Strickland, Rockwell & Bowyer, published by Prentice-Hall at £16.10 (paperback, 257 pages).

'Games, Graphics and Sound' offers an odd contribution. It contains listings for games and graphics programs in Basic, which is fair enough, but there are also listings in Pascal and, believe it or not, in Fortran. I wouldn't have thought anyone familar with either of these two languages would be interested in the routines given, such as defining and drawing an alien. The text is dry and rather formal.

'IBM Personal Computer' by Goldstein & Goldstein, published by Prentice-Hall at £39.08 (including disk)

The weighty and expensive tome 'IBM PC' comes with a tutorial disk, but it's little more than a Basic primer with a bit of information about the PC and its DOS. The programs are uninspired and the text is dull, but it does go into file handling which should be useful.

Bryan Skinner

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BACK ISSUES

Copies of Issues 1 to 7 are still available from our Back Issues Department (see order form on next page). For details of their contents please call the number given.

Issue 8, April 29-May 6.
Pro-Tests: Atari Home Files Manager, Kobra's Vic Stat for the Vic 20, Hestacrest's Accounts for the Spectrum; Epson RX80 printer. NCR's Decision Mate V. Future Computer's FX20.
Features: Micronet, Compact programming on the TI99/4A.
Gameplay: Harvester (Vic 20), Strategic Command (Dragon 32), A first Book of Micro Rhymes (BBC), Telling the Time/Money (Spectrum).
ProgramCards: Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.
Databasics: software.

Issue 9, May 6-13.
Pro-Tests: Structured Basic on the Apple, Pixel Power on the Vic 20; Star DP510 printer, Dams and Interpod interfaces for Commodore 64; Micro-Professor.
Features: BBC function keys, Atari word-processing part 1.
Gameplay: Dungeons of Intrigue (Oric), The Castle (Oric), Starship Command (BBC B), Dragon Trek., Nowotnik Puzzle (Spectrum).
ProgramCards: Lower case (Dragon 32), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MBasic).
Databasics: hardware.
Micropaedia: Graphics, part 4.

Issue 10, May 13-20.
Pro-Tests: Infomast on Commodore 64, Dragon Mace; MC202 and CMU800 music synthesisers (Apple), Prism directly coupled modem; Epson QX10.
Features: ZX81 graphics part 1; Atari word-processing part 2.
Gameplay: Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).
ProgramCards: Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).
Databasics: peripherals.
Micropaedia: Graphics, part 5.

Issue 11, May 20-26.
Pro-Tests: BBC Vufile, PFS:File for IBM, Apple Pascal; printer comparison, Pickard Joystick Controller for ZX81 and Spectrum; C9E Computer Board.
Features: ZX81 graphics part 2, Basic on the Sharp MZ80K.
Gameplay: Motor Mania (Commodore 64), Oric Flight, BBC Music Synthesiser, Music Maker (Spectrum), Embassy Assault (Spectrum), Tobor (Spectrum).
ProgramCards: Homeward Bound (ZX81), Connect Four (Dragon 32), CBM Database, cards 10 — end.
Micropaedia: Keyboards.

Issue 12, May 27-June 2.
Pro-Tests: Spectrum word processor, PFS:Report on IBM, File Handling on Colour Genie; CTI CP80 type 1 printer, TG Trackball; Sord M5.
Features: Epson Basic, Oric sound part 1, Tandy Colour graphics.
Gameplay: Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.
ProgramCards: Election Barchart (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).
Databasics: Hardware.
Clubnet: clubs (Cambridge Microcomputer Club special).
Micropaedia: Disk Drives, part 1.

Issue 13, June 3-9.
Pro-Tests: Telewriter for Dragon 32, Abersoft Forth for Spectrum, GPS graphics processing system for Apple II+; joysticks, rulers; Ajile.
Features: Dragon meets Tandy, Oric music part 2, transferring Basic for Colour Genie and Genie I.
Gameplay: Everest Ascent (Spectrum), Colour Genie roundup, Micro Maze (Jupiter Ace), Qix (Atari).
ProgramCards: Cupid (Oric), Alien (Dragon 32), Time Bomb (Atari).
Databasics: peripherals.

Issue 14, June 10-June 15.
Pro-Tests: Apple Accelerator II board, Modula-2 (Apple II), Oric Base, Joystick Control Unit J6, Kempston Centronics Interface. BBC Speech Synthesiser.
Features: Newbrain Basic part 1, Sirius designing.
Gameplay: Ah Diddums (Spectrum), Monopole (Commodore 64), Automonopoli (Spectrum), Dragon dramatics.
ProgramCards: Time Bomb (Atari, cont), Sheep Drive (BBC B).
Databasics: Software.
Micropaedia: Spectrum, Part 1

Issue 15, June 16-June 22.
Pro-Test: Comx 35, Address Manager (Spectrum), Sysres (Commodore 64), MST Database (Epson HX-20), Voice Input Module (Apple II).
Features: Newbrain Basic part 2, Genie scene.
Gameplay: Cleared for Landing, Playing the Ace (Apple II), Vultures, Star Jammer (Dragon 32).
Programcards: Mover (BBC B), Sprite Clock (Commodore 64), Pirate Island (Atari, 3 of 9), Micro-mind (Colour Genie), Brickbat (Dragon 32).
Databasics: Hardware.
Micropaedia: Spectrum, part 2.

Issue 16, June 23-June 29.
Pro-Tests: Atari v Acorn, word processing for the Commodore 64, Simplifile (CP/M), MPF-II printer, Z80 Pack for BBC.
Features: ZX81 Maths, US mail order, Atari graphics.
Gameplay: Computer Scrabble (Spectrum), Education (BBC), Horace and Spiders (Spectrum), Catcha Snatcha (Vic 20).
ProgramCards: Video Titler (T199/4A 3 of 6), Bowling (Spectrum), Pirate Island (Atari cont).
Micropaedia: Spectrum, part 3.

Issue 17, June 30-July 6.
Pro-Tests: Duet-16, The Organizer (CP/M), Trace and ZX Text (Spectrum), Juki 6100 daisywheel, Videx Ultra Term (Apple II).
Features: Leasing part 1. Atari screen action.
Gameplay: Oric chess, Grand Master (Commodore 64). Escape from Orion (BBC), Jet Pac (Spectrum), The Ring Of Darkness (Dragon 32), Spectrum spectacle.
ProgramCards: Video Titler (T199/4A cont), Pirate Island (Atari cont) Word processor (BBC).
Micropaedia: Sound, part 1.

Issue 18, July 7-July 13
Pro-Tests: Tandy 100, RS232 interface (ZX81), ROM pager (Commodore), Interface printer buffer, IBM Personal Basic, Spectrum assembler, Newbrain WP.
Features: Leasing Part 2, Lynx music.
Gameplay: Spectrum Backgammon, BBC Snooker, Commodore 64 round-up, Serpentine (Vic 20), Psst (Spectrum), Spectrum Safari.
Programcards: Word Processor (BBC), Fruit Machine (Spectrum).
Micropaedia: Sound Part 2.

Issue 19, July 14-July 20
Pro-Tests: 16-bit chips, Stock control (Epson HX20), Mailplus (Torch), Smith-Corona daisywheel, ZX81 word processing.
Features: Insurance, buying secondhand.
Gameplay: Escape MCP (C64), Escape from Perilous (Atari), Apple round-up, Temple of Apshai (C64), Airline (Spectrum), Heathrow (Spectrum).
ProgramCards: Colour Code (Atari), Wreck (Dragon).
Micropaedia: Sound, part 3.

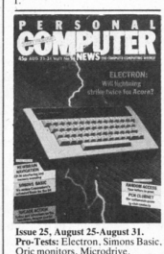
Issue 20, July 21-July 27
Pro-Tests: Rade bareboard, Vic digital tape drive, Seikosha colour printer, Toolkit (Spectrum), Bonus (Pet payroll), Newbrain monitor.
Features: Computer art, Dragon scrolling.
Gameplay: Rabbit Trail (TI99/4a), Aztec Challenge (Atari, Vic 20, TI99/4a), BBC round-up, Joust (Spectrum), Molar Maul (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).
ProgramCards: Tumbler (Oric) Wreck (Dragon), Atari Errors, Speed Race (Vic 20).
Micropaedia: Sound, part 4.

Issue 21, July 28-August 3.
Pro-Tests: BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.
Gameplay: Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).
ProgramCards: Collection (Vic), Bomber (64), Definer (BBC).
Micropaedia: Sound, part 5.

Issue 22, August 4-August 10.
Pro-Tests: Spectrum Forth, BBC graphics, Music synthesisers, IBM plotter, Brother daisywheel, Mallron keyboard, Mupid.
Features: Genie assembler, Dragon machine code.
Gameplay: River Rescue, Orc Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Moria (Oric), Velnor's Lair (Spectrum).
Micropaedia: CP/M part 1.

Issue 23, August 11-August 17.
Pro-Tests: Sord Basic-G, Tasword, BBC microfloppies, Microdrive, Tandy Model 4.
Features: Dragon machine code, Atari controllers.
Gameplay: Bridge Master, Styx, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (Oric), Everest (Dragon).
Micropaedia: CP/M, part 2.

Issue 24, August 18-August 24.
Pro-Tests: T-Maker III, Spectrum Fifth, daisywheels surveyed, Spectrum digital tracer, Laser.
Features: Videotex, Dragon machine code.
Gameplay: Oric roundup, Cookie, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (64).
Micropaedia: Commodore 64, part 1.



Issue 25, August 25-August 31.
Pro-Tests: Electron, Simons Basic, Oric monitors, Microdrive.
Features: Newbrain map, Acorn Atom, Dragon machine code.
Gameplay: Suspended (64), Terror Daktils, Tranz AM (Spectrum), Dragon roundup, Jogger (Oric), Frogger (IBM).
Micropaedia: Commodore 64.

Issue 26, September 1-September 7.
Pro-Tests: Microtan 65, BCPL, BBC tracer, 80 column Pet, Oric interfaces.
Gameplay: Magic Mountain, Smugglers Cove (Spectrum), Spectrum roundup, Hovver Bovver, Benji-Space Rescue (64).
Micropaedia: Dragon, part 1.

Issue 27, September 8-September 14.
Pro-Tests: Sharp MZ700, BBC Lisp, Apple editor, IBM mice, ZX81 surgery.
Gameplay: Zip-Zap, Zzoom (Spectrum), Spectrum roundup, Hovver Bovver, Benji-Space Rescue (64).
Micropaedia: Dragon, part 1.

Issue 28, September 15-September 21.
Pro-Tests: Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM mice.
Gameplay: The Witness, Super Scramble, Six (64), Harrier Attack (Oric), Morocco Grand Prix (Dragon), Pharoah's Tomb (Spectrum.
Micropaedia: Dragon, part 2.

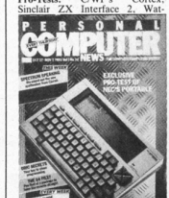
Issue 29, September 22-September 28
Pro-Tests: Portico Miracle, Dragon editor, BBC toolkit, Dragon drives. Apple light pen.
Features: HX20 disassembles, TI transformations.
Gameplay: Gridder, Gloopert, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Splat, General Election (Spectrum).
Micropaedia: Dragon, part 3.

Issue 30, September 29-October 5.
Pro-Tests: NEC's Advanced Personal Computer, Financial Planner (IBM), Kongman's a.b.c. Countabout Hot Dog Spotter (Spectrum), Prism VTX5000, Extended Basic (Dragon).
Features: Spectrum machine code.
Gameplay: Halls of Death/Sword of Fargoal (64), 747 Flight Simulator (BBC), Dragonfly (Dragon 32), Forensic/Note Invaders (BBC).
Programs: Search (ZX81), Composer (Oric).
Databasics: Hardware.
Micropaedia: Everything you wanted to know about programming, part 1.
Clubnet: Clubs.

Issue 31, October 6-October 12.
Pro-Tests: Atari 600XL, Condor Series 20 (IBM), Acacia Non-volatile Diary/Filing system (BBC). ROM extension board (BBC).
Features: Oric sound routines.
Gameplay: Greedy Gulch (Spectrum), Kong (Spectrum), Crazy Kong (64), Cuthbert Goes Walkabout/Movie Producer (Dragon).
Programs: Composer (Oric), 555 (Spectrum), Anagrams (Dragon).
Databasics: Peripherals.
Micropaedia: Everything you want to know about programming, part 2.
Clubnet: User Groups.

Issue 32, October 13-October 19.
Pro-Tests: Mattel Computer Adaptor (Intellivision), Sprite-Gen (BBC), Typing Strategy (Apple), MCoder 2 (Spectrum), Cirtech Eprom Programmer (Apple).
Features: Telesoft options, Inside the Genie.
Gameplay: Space Shuttle Frogger (Dragon 32), Atari roundup, Spectadraw 2/Football Pools Program (Spectrum).
Databasics: Software.
Clubnet: Clubs.
Programs: Bees Away (BBC), Composer (Oric).
Micropaedia: Everything you wanted to know about programming, part 3.

Issue 33, October 20-October 26.
Pro-Tests: C/WP's Cortex, Sinclair ZX Interface 2, Watford DFS (BBC), Wordsworth (BBC), Atariwriter.



Features: Oric Operating System.
Gameplay: Dragon roundup, Hustler (64), Cricket/Luna Crabs (Spectrum), 3 Deep Space (BBC).
ProgramCards: Key Utility (Lynx), Bees Away (BBC), French Test Card (Apple).
Databasics: Clubnet.
Micropaedia: Everything you wanted to know about programming, part 4.

Issue 34, October 27-November 2.
Pro-Tests: NEC's PC-8201A, Simply File (64), The Forest (Spectrum), Amcom DFS (BBC), Currah Microspeech (Spectrum).
Features: Oric Machine Code.
Gameplay: Fort Apocalypse/Pooyan (Atari), Death Cruise/I Ching (Dragon), Trench/Canyon (BBC), Football Manager/Pool (Spectrum).
Programs: French Test (Apple), Babyfall (ZX81), Count (Vic 20), Men/Arith (Vic 20), Road Hog (BBC).
Databasics: Hardware.
Micropaedia: Everything you wanted to know about programming, part 5.

Issue 35, November 3-November 9.
Pro-Tests: Kaypro 10, Stock Control (Spectrum), Educational games (BBC), Brother EP22 electronic typewriter, ADS Centronics Interface (Spectrum, Jupiter Ace).
Features: Tandy Graphics, BBC Operating System.
Gameplay: Valhalla (Spectrum), 64 roundup, Slinky (Atari), Hexpert (64).
Programs: Mini Math (Spectrum),

Multi-Square (Oric).
Databasics: Peripherals.
Micropaedia: Everything you wanted to know about programming, part 6.

Issue 36, November 10-November 16.
Pro-Tests: Tiger from H/H, ZX81-Forth, Exmon (Oric), Cycle Planner, Growth Tracker/Dieta/Diet Master (Spectrum), U-Com 2 (Apple).
Features: Newbrain sound, BBC FX commands.
Gameplay: Creepers (Vic 20), Extermintator (64), Spectrum roundup, Death Mines of Sirius (Dragon 32).
Programs: Falklands Raid (BBC), Mini Math (Spectrum), Pyramid (Spectrum).
Databasics: Software.
Micropaedia: Everything you wanted to know about programming, part 7.

Issue 37, November 17-November 23.
Pro-Tests: Apricot, Paint (Atari), BBC Micro Toolbox, Spectravideo Compumate (Atari VCS 2600), Big Ears.
Features: Flight simulators, Spectrum screening.
Gameplay: Empire/Treasure Tomb, Crystal Chalice, Temple of Zoren (Dragon 32), Cobus Maze/Bewitched (Vic 20), Cosmic Convoy/Planetfall (64), Bugaboo/Gorgon (Spectrum).
Programs: City Defense (Oric), Falklands Raid (BBC), Pyramid (Spectrum), Monitor (64).
Databasics: Clubnet.
Micropaedia: Everything you wanted to know about programming, part 8.

Issue 38, November 24-November 30.
Pro-Tests: Coleco's Adam, Small Business Accounts (Spectrum), Masterfile (BBC), Monitor roundup.
Features: Apple programming, NewBrain editor part 1, Dragon action part 1.
Gameplay: Dragon roundup, Zeppelin/Blue Max (Atari), Skramble/Falcon Patrol (64), 737 Flight simulator (BBC).
Programs: Shipment (Spectrum), Monitor (64).
Databasics: Hardware.
Micropaedia: Guide to Monitors.

Issue 39, December 1-December 7.
Pro-Tests: Dragon 64, Tandy CGP-220, White Knight II (BBC), Cross Reference Utility (IBM).
Features: NewBrain editor part 2, Dragon Action part 2.
Gameplay: Oric roundup, Haunted Hedges/Corridors of Genon (Spectrum), Microbe/One Hundred & Eighty (BBC), Atari roundup.
Programs: Lower CLS (Spectrum), Shipment (Spectrum), Monitor (64), Basic Search (BBC).
Micropaedia: Buyer's Guide to Micros.

Issue 40, December 8-December 14.
Pro-Tests: Timex 2058, Thermal Printer TP-10, Cambridge Computing joystick (Spectrum), Beebsynth/The Synth/Music Processor (BBC), Vizawrite/Vizaspell (64), Education games (Spectrum).
Features: NewBrain editor part 3, Dragon Action part 3.
Gameplay: Pinball Wizard (Vic 20), The Quest of Merravid (64), Wavy Navy/Savage Pond (Atari).
Programs: Link Four (Spectrum), Tilt (Dragon).
Micropaedia: Buyer's Guide to Peripherals.

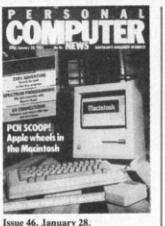
Issue 41, December 15-December 21.
Pro-Tests: Apple II, Byte Drive 500, INMAC Power Cleaner, Commodore 1701 Colour Monitor, BCBasic(64), Database/MST-Calc (Dragon).
Features: Computerised Psychotherapy (BBC), Spectrum Display.
Gameplay: Micropoly/Pettigrew's Diary (Dragon), 64 roundup, Dimension Destructors/Sheer Panic (Spectrum).
Programs: Colony Invader (Spectrum), Grid Bike (Vic 20).
Micropaedia: Buyer's Guide to Software.

Issue 42, December 22-January 4.
Pro-Tests: Spectrum add-ons (U-Microcomputers system), Oric-1 Filestar, Games Designer (Spectrum).
Features: Micros of 1983, Computer Security, BBC word processing, Dragon Action part 4.
Gameplay: International Football (64), Grouch/Chequered Flag (Spectrum), Way Out/Jet Boot Jack (Atari), Supervaders/Outback (Vic 20), Danger Ranger/Up Periscope (Dragon 32).
Databasics: Clubnet.
Micropaedia: Games Special.

Issue 43, January 7.
Pro-Tests: IMB Junior, Grafpad (BBC), Walters WM80 printer Devpac (Spectrum).
Features: Computerspeak, Spectrum Display, Tabs on Oric.
Gameplay: Trace Race/Pinball (Dragon 32), Colour Genie roundup, Hunter Killer/Mr Wimpy (Spectrum), Crazy Cavemen/Goodness Gracious (64).
Programs: Jungle Chase (Oric), Screen Dump (BBC).
Databasics: Hardware.
Micropaedia: Electron part 1.

Issue 44, January 14.
Pro-Tests: Hitachi MBE-16002, Acorn Teletext (BBC), Integrex Colourprinter, DTL-Basic (64), Dlan/Microprint 42/51/Multifront (Spectrum).
Features: Adventure games, Colour Genie characters.
Gameplay: Devil Assault/Wasps + Dragon Racer (Dragon 32), Siren City/Forbidden Forest (64), Survival/Countdown (Vic 20).
Program: Minefield.
Databasics: Peripherals.
Micropaedia: Electron part 2.

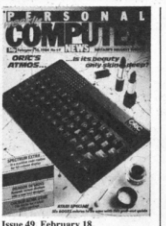
Issue 45, January 21.
Pro-Tests: Portables — Commodore SX64, Olivetti M10; Acorn sparkjet printer; Turbo 20 daisywheel; Spectrum educational software; BBC graphics extension ROM.
Features: Bargain buys; Making money with your micro.
Gameplay: Viking and Pub Crawl (Dragon), Traxx and Wild West Hero (Spectrum), Atari/Commodore 64 round-up.
Programs: Battlestar Fighter (Commodore 64).
Databasics: Software.
Micropaedia: Electron part 3.



Issue 46, January 28.
Pro-Test: Apple Macintosh; BBC sideways ROM board; IEEE interfaces for Commodore 64; Silver Reed EX44 typewriter/printer; Bridge on Spectrum and Dragon; BBC filing program.
Features: Buying by mail order; programming the Memotech.
Gameplay: Barmy Burgers and Gangsters (Spectrum), Birdie Barrage and Plankwalk (BBC), Blue Moon and Dancing Feats (Commodore 64).
Programs: Caves of Treasure (ZX81).
Clubnet
Micropaedia: Modems and communication.

Issue 47, February 4.
Pro-Tests: Sinclair QL; Atari Touch Tablet; Silver Reed EXP500 daisywheel; IBM Cobol; BBC Spell Check.
Features: Programming the Memotech part 2; Low cost printers.
Gameplay: Mothership and Quintic Warrior (Commodore 64), Two Gun Turtle and Multigames (Oric), Apple adventures, Spectrum round-up.
Programs: Pot Hole (Dragon)
Databasics: Hardware.
Micropaedia: A to Z of Atari part 1.

Issue 48, February 11.
Pro-Tests: Spectravideo 328; Atari 800 XL; Dragon 3in disk drives; low cost monitors; Aztec C (Apple); BBC educational software.
Features: Sideways printing on Epson HX20.
Gameplay: Bedlam and Morris Meets the Bikers (Spectrum); Commodore 64 round-up; Zorgon's Kingdom and Flight Zero-One-Five (Vic 20).
Programs: Gridtrap (Lynx).
Databasics: Peripherals.
Micropaedia: A to Z of Atari part 2.



Issue 49, February 18.
Pro-Tests: Oric Atmos; tracker ball controllers; Spectrum speech synthesisers; Rainbow Writer (Dragon); Colour Genie assembler; Spectrum educational programs.
Features: Computer jargon; 42-column display on Spectrum.
Gameplay: Quadrant and Jetpac (Vic 20); Crazy Balloon and Supacatchatrapa (Commodore 64).
Programs: Sprite generator (Commodore 64).
Databasics: Software.
Micropaedia: A to Z of Atari part 3.

Issue 50, February 25.
Pro-Tests: Sanyo MBC550; Commodore speech synthesiser; BBC real-time control interface; BBC machine code trace; Atari home utilities.
Features: Expanding your Spectrum; introduction to Lisp.
Gameplay: Urban Upstart and Godzilla and the Martians (Spectrum), Shuttlezap and Hooked (Dragon).
Programs: Minescape (Oric).
Clubnet
Micropaedia: Printers part 1.

Issue 51, March 3.
Pro-Tests: Sharp's PC5000, Graphics Package (Oric), Fancy Font (CP/M, Torch), Superbase Application Database (64), Printer round-up, IEEE 488 Interface (BBC).
Features: Microdrive data files.
Gameplay: Spectrum selection, Robopods (TI99/4A), Batty Builders/Bristles (Atari).
Programs: Millipede (BBC/Electron).
Databasics: Hardware.
Micropaedia: Printers, part 2.

Issue 52, March 10.
Pro-Tests: Wren, MSX, Multisynth 64, Mr T's Number Games etc (BBC, Spectrum, 64), Hybrid cable (Oric, Atmos).
Features: Adventure games.
Gameplay: Dragon roundup, Snorter/Free Fall (BBC), Spectrum roundup.
Programs: UFO (Vic-20), Morse Code (BBC), Gary the Guitar (64).
Databasics: Peripherals
Micropaedia: Printer, part 3.

Issue 53, March 17.
Pro-Tests: Yamaha YIS503, Tandy TRS-80 modem (RS232), MDDFS (BBC), Toolkit (BBC), The Quill (Spectrum).
Features: Screen technology, Atari graphics.
Gameplay: Megahawk/Megawarz (64), Castle of Doom/Fishy Business (Dragon 32).
Programs: Battle Stations (Spectrum).
Databasics: Software.
Micropaedia: Reaching for the Atmos, part 1.

Issue 54: March 24.
Pro-Tests: IBM's Portable PC, Spectrum keyboards, Beebfont, Games Designer (Vic-20).
Features: Atari graphics, Chip shortage.
Gameplay: Airstrike 2/Pole Position (Atari), Deathchase/Fighter Pilot (Spectrum), BBC roundup.
Programs: Othello (64), Charpatt (CGL M-5).
Clubnet: User groups and clubs.
Micropaedia: Atmos, part 2.

Issue: 55, March 31.
Pro-Test: H-P 150, Light pens (BBC, 64), Micro-Prolog (Spectrum), Electron Graphics System.
Features: Spectrum routines, Consumer rights.
Gameplay: Patience/Metagalactic Llamas Battle at the Edge of Time (Vic-20), Loki/Rat Splat (Oric), Tennis (Atari).
Programs: Fast Draw (Dragon 32), Flash simulator (Atari).
Databasics: Hardware.
Micropaedia: Communications, part 1.

Issue 56, April 7.
Pro-Tests: Votrax Type 'n Talk, Micro Command (BBC, Spectrum, 64), Commodore 1001 disk drive, Apple's Macintosh, Animator (Dragon 32), Knoware (IBM).
Features: Spectrum maths, Adventure in history.
Gameplay: Hunchback Aztec Challenge (64), Defence Force/Psycho II (Oric), Volcanic Planet (Spectrum).
Programs: Ape King (Vic-20), Lynx VAL.
Databasics: Peripherals.
Micropaedia: Communications, part 2.

Issue 57, April 14.
Pro-Tests: Microkey, Morex Disk Drive Interface (Spectrum), Atari 1020 colour printer/plotter, FT Moneywise (IBM PC, Sirius).
Features: Assembly course, Portables.
Gameplay: Learning games (Spectrum, Oric), Air Traffic Control/Super Spy (Dragon), Neptune's Daughters/China Miner (64).
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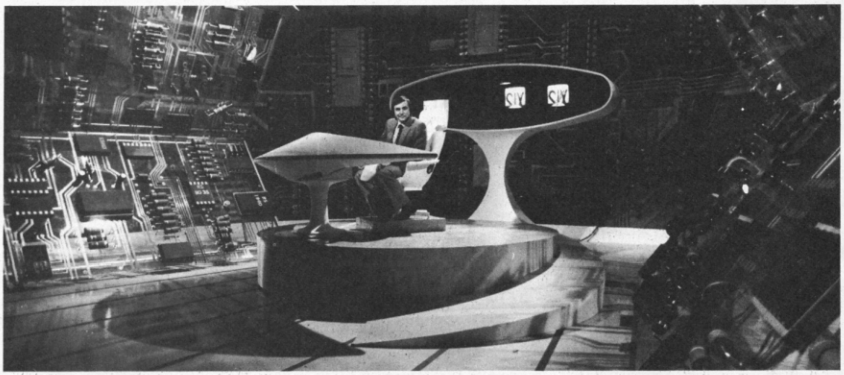

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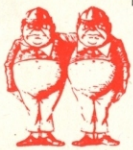

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Not Fade Away — Or how the Spectrum's sound capabilities can become a treat for your ears.

OSsified? — Certainly not, say the fans of the OS9 operating system. Find out where the truth lies.

Kama Koala — We put Audiogenic's graphics tablet through its paces.

Games — Home in on reviews of Spectrum and Oric games.

Just say the world . . .

Bouncing back after its enforced absence the Great *PCN* Gobbledegook and Gibberish Contest returns.

From the *Times* (April 10) comes confirmation of what many people have suspected for a long time — there's nothing the IBM PC can't achieve when it comes to global hegemony.

From the Commodore 1526 printer manual the following appears under Setting-up.

Thanks to whoever sent in the clipping from the *Times* and to Brian Rogers of Crawley. He wins £5 and for the *Times* piece we'll donate the £5 to a charity.

■ IBM has announced Displaywrite 2, a new world processing program for its personal computer-the PC. It is based on the Textpack 4 software for the Displaywriter and is menu driven.

In addition to the usual word

2. Remove shipping screws.
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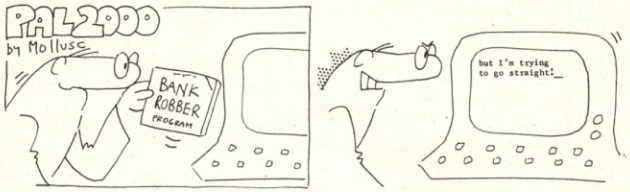

SYNTAX ERRORS

Texas Instruments die-hards are asked to be patient with Howard Greenberg of Arcade Hardware. Some of the items we said (Issue 57) he has, he hasn't — yet. The MBX, RS232, and thermal printer are on order. In stock are games including Atari modules, books, and TI modules brought to the UK for the first time.

What you think of Figaro will probably depend on your ear for music but that's no excuse for our misrepresenting Saxon Computing's Figaro 64 package (Issue 60). We called it a spreadsheet; Saxon calls it a numeric database designed to handle wadges of data with calculator functions and graphics included.

Einstein's hypothesised curving of space and time seems to have warped our report on the Tatung Einstein (Issue 60). First, we should stress that the machine costs £499, not £599, that its processor is a Z80A, not a Z80, that its disks are 3in Hitachis, and that games prices will start at around £7.

Our report wasn't deliberately misleading — we're just the victims of galactic forces beyond our control.

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UK EVENTS

Event	Dates	Venue	Organisers
Computer, Business Systems & Communications Equipment Exhibition — MICRO CITY	May 15-17	Bristol Exhibition Centre Canons Road City Centre, Birmingham	Tomorrow's World Exhibitions Ltd, 0272 292156/7
DEC User Show	May 15-17	Novotel Hotel, London W6	Contact David Evans 01-837 3699
RIBA Computer Exhibition	May 22-24	Bloomsbury Crest Hotel, Coram St, London WC1	RIBA Services, 01-637 8991
Apple '84	May 24-26	Fulcrum Centre, Slough	Database Publications 061-456 8383
Electronic Office Conference	June 5/6	Intercontinental Hotel, London W1	Financial Times Conference Organisation 01-643 1355
Software '84	June 5-7	Earls Court, London SW5	Reed Exhibitions 01-643 8040
Electronic Office Conference	June 5/6	Intercontinental Hotel, London. W1	Financial Times Conference Organisation, 01-621 1355
Software '84	June 5-7	Earls Court, London SW5	Reed Exhibitions, 01-643 8040
Office Automation Show	June 7-9	London Barbican	Clapp & Poliak, 01-891 5051
5th International Commodore Show	June 7-9	Novotel Hotel, Hammersmith, London W6	Granard Communications

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Mini/Micro Northeast	May 15-17	Boston, USA	Electronic Conventions Inc., 0101 213 772 2965
Micro Exposition	May 22-26	Paris	J. Watts Marketing Ltd., 0344 88648
International Computer Show for Office, Home, Hobby	June 14-17	Cologne, Germany	German Chamber of Industry and Commerce, 01-930 7251

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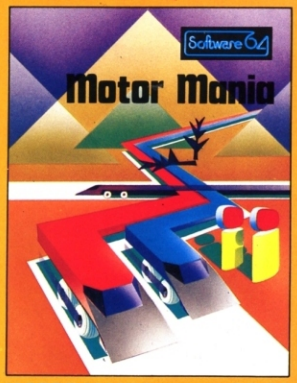
MACHINE CODE GAMES ACTION FOR THE 64

Software 64



MOTOR MANIA **£8.95**
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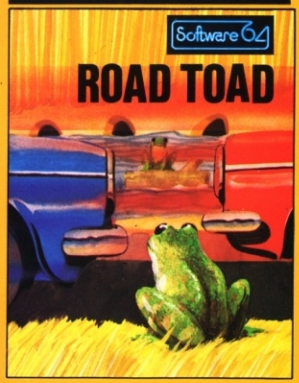

ROAD TOAD **£5.95**
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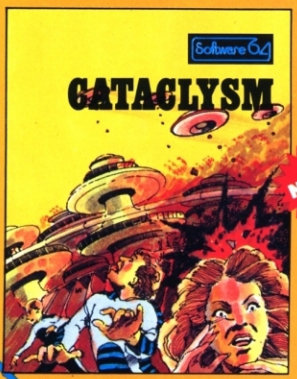


NEW

WORD FEUD **£7.95**

This brilliantly conceived program combines the best parts of arcade games with the best of educational games, making a real family game that anyone who can see the screen can participate in. You have to find the word that is hidden twice in the jumble of letters, then guide your sights over one of the occurrences of it.

The first to find it wins! You can play by yourself or in teams against the computer, or against other players. Three difficulty levels are included to suit young and old alike!

BONZO 64 **£7.95**

This best-selling game for the VIC-20 is now available on the 64! Featuring the most intelligent and devious monsters you have ever tried to avoid, the Bonzos, this game is a real joystick wrencher. Move Hans, the handyman, up and down the ladders to pick up the boxes from the different levels.

But don't meet a Bonzo on the way!

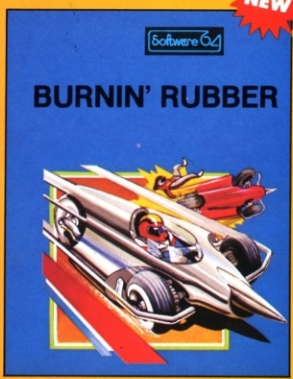
NEW

CATACLYSM **£5.95**

Pure shoot-em-up arcade action for the 64 and unexpanded VIC! The Lunar city of Erriam is under attack from the ships of the Jovion empire. Their merciless bombing will reduce your city to a pile of rubble, unless you can hold them off. You are the commander of the sole laser defence base. Your mission - hold out for as long as possible.

BURNIN' RUBBER

You are an entrant in the great Intergalactic Four Seasons Death Race!. You must tackle the Spring, Summer, Autumn and Winter sections with the objective of running as many other cars as possible off the road. The opposition is numerous, including the indestructable but slow Tank Cars, the tricky Deathmobiles and many other Demon Drivers. You have one advantage - your car can fly for a limited distance, allowing you to avoid hazards if you're quick enough! All this and more makes Burnin' Rubber the car race of the century!



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